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THE

# MEDICAL AND SURGICAL HISTORY

OF THE

# WAR OF THE REBELLION.

PART II.

## VOLUME I.

# MEDICAL HISTORY.

BEING THE

SECOND MEDICAL VOLUME.

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# INTRODUCTION.

This volume treats of the Alvine Fluxes. It was my original intention that it should have embraced sketches of several of the other diseases which ranked as the chief causes of Sickness and Mortality among our troops during the Civil War. As the work progressed I saw that a due consideration of the questions connected with the Fluxes would occupy much more space than I had anticipated, yet still for a time hoped that I might succeed in compressing the discussion of the Camp Fevers also into this volume; but I became convinced that to do so would exclude a great deal of material relating to the Fluxes which I had collected and believed to be useful, so that I finally concluded to postpone the consideration of the Fevers, as well as the other chief camp diseases, to the Third Medical Volume of this work.

The nature of the subject will, I trust, justify this determination. Not only do the Alvine Fluxes usually cause more sickness and mortality among troops during war than any other group of diseases, but this circumstance affords a better opportunity for their study than can commonly be obtained in times of peace, so that it has heretofore happened that many of the most important accounts of these disorders, whether in ancient or modern times, have been the fruit of military experience. When I came to study carefully the documents and pathological specimens relating to this subject which had been collected by the industry of our Medical Officers during the Civil War, I formed the opinion that they were well worthy of presentation in detail; and when I began the task of interpreting them by the aid of previous experience, I was led to believe that the time had arrived when modern observations might profitably be contrasted with the records of the past, and the historical basis of the dominant opinions of the present day be subjected to careful and critical scrutiny.

This I have not hesitated to attempt. The great Medical Library which my colleague, Surgeon John S. Billings, has been enabled, by the liberal policy of the Surgeon General of the Army and the annual appropriations of Congress, to collect for the benefit of Medical Officers and of the Medical Profession of the country, has afforded me opportunities for the study of the ancient and modern literature of the subject not heretofore enjoyed by any American medical student, and I have endeavored to make the best use I could of the resources at my disposal. I have not, indeed, attempted to present a complete analysis of the literature of the Fluxes. Such a work would have occupied several years of study in addition to those already expended, and the practical results could hardly be hoped to repay

the time and labor required. But I have endeavored to trace all the more important opinions to their sources, and to weigh the observations by which they are supported.

In view of the many errors of fact scattered through the text-books, some of which have been repeated for ages by authors copying from each other, I early resolved that, so far as possible, I would cite no authority not before me when I wrote; and that, for the convenience of subsequent students, I would in every case give not only the name of the author but the edition and page to which each citation referred. In the few instances in which the incompleteness of our growing library has compelled me to depart from this rule, I have explicitly stated the fact and mentioned the actual source of my information. Large as the volume has become it would have occupied more than double the number of pages had the literary references and citations been embraced in the text. I have therefore adopted the plan of presenting all such matter, as far as possible, in foot notes, where, by using small type, much could be compressed into comparatively little space. I know that this small type is not very easy reading, but I suppose most readers will hardly trouble themselves with these references to authorities, and the future student who may undertake original investigations with regard to any of the subjects I have discussed will, I hope, forgive the type in view of the character of the matter embraced in the notes, which I trust will serve to make his task somewhat easier than mine has been.

Although the discussion of the Alvine Fluxes has occupied so much more space than I had intended, I feel quite confident that this Medical History can be completed in the Third Volume, as was originally planned. A large amount of valuable material relating to some of the other more important camp diseases has been collected, but it does not appear to me to be sufficiently complete in the case of any of them to serve as the basis of such systematic analysis as I have ventured upon in the case of the fluxes. The Third Medical Volume will therefore be limited to the presentation of these materials, together with a series of special studies based upon them, and necessarily limited by them in scope and extent. The account of the Camp Fevers and of Scurvy will require the greatest space; but even in connection with these I shall not attempt an exhaustive mode of discussion. Nevertheless the special studies which I expect to present relate to questions so intimately connected with the health and mortality not only of Armies but also, under certain circumstances, of Civil Populations, that I indulge the hope that they will be found useful by civil practitioners as well as by the medical officers of military organizations. May this prove true also of the present volume, now at last, with much labor and after serious interruptions, brought to a conclusion.

JOSEPH JANVIER WOODWARD,
*Surgeon, United States Army.*

March 25, 1879.

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NOTE.—Of the foregoing illustrations the colored diagrams, Plates I and II, were executed by Mr. E. Sinclair, of Philadelphia; the chromos, Plates III, VI, VIII, XIV, XIX, XX, XXVII, XXX, XXXI, and XXXIII were executed by F. Moras, of Philadelphia, under the supervision of Mr. Hermann Faber, by whom the original water-color drawings were made. Plates IV, V, VII, XV, XVI, XVII, XVIII, XXI, XXII, XXIII, XXVIII, XXIX, XXXII, XXXIV, XXXV, XL, and XLI are reproduced from photographs of the specimens selected, made at the Museum by Mr. E. J. Ward. With the exception of Plate VII they were reproduced for the first five thousand copies of this work after the Woodbury-type process by the American Photo-relief Company, under the supervision of Mr. John Carbutt, of Philadelphia. This process, commended by Mr. ALEXANDER AGASSIZ—(No. 2, *Applications of Photography to illustrations of Natural History*, Bulletin of the Zoological Museum of Cambridge, November 30, 1871,) and subsequently employed by that naturalist for a portion of the plates of his splendid *Revision of the Echini*, Cambridge, 1872-'73—was also selected by my colleague, Assistant Surgeon G. A. Otis, U. S. A., for a number of the photographic plates in the Second Surgical Volume of this work. Meanwhile, however, the Heliotype process had been made available in this country by the enterprise of James R. Osgood & Co., of Boston, under the supervision of Mr. Ernest Edwards, and as this method was found to give results which in delicacy and beauty closely approximate the Woodbury-types, while the plates, being executed in printer's ink on ordinary plate-paper, must be as permanent as the letter-press itself, it was selected for the second five thousand copies authorized by the act approved June 23, 1875. Plate VII was reproduced by the Heliotype process for both editions. Plates IX, XXV, XXVI, and XXXVI are copied from photo-micrographs, magnified 12 diameters, by Assistant Surgeon E. Curtis, U. S. A. They were etched on steel by Mr. H. Faber. Plates X, XI, XII, XIII, XXIV, XXXVII, XXXVIII, and XXXIX are fac-similes of photo-micrographs made by myself, with powers varying from 63 to 280 diameters. They were reproduced for the first five thousand copies by the Woodbury-type, and for the second by the Heliotype process, as in the case of the other photographic plates. The original negatives, and the preparations copied, are preserved in the Army Medical Museum.

J. J. WOODWARD, *Surgeon, U. S. A.*

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NOTE.—Of the above cuts Figs. 7, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 22, 23, 24, 28, 29, 30, 32, 37, 38, 39, 40, 41, and 42 are copied from photo-micrographs made by myself. I should have greatly preferred to have reproduced them by the Heliotype process, but economical considerations rendered this impracticable. I was therefore happy to be able to avail myself of the services of Dr. J. C. McConnell, by whose skilful hands most of the microscopical sections to be represented had been cut,* and who has executed for me a series of beautiful pen-drawings of the same size as the original photographs. From these the cuts were copied by the Photo-relief Company, No. 67 Park Place, New York. It was generally necessary to make the cuts considerably smaller than the original drawings, to which they are inferior in sharpness; yet, on the whole, I think the results equal in beauty and certainly superior in accuracy to the best I could have obtained by engraving on wood. Figs. 33, 34, 35, and 36 were reproduced in the same manner from drawings made by Dr. McConnell after photographs of the same size as the objects represented, made by Mr. E. J. Ward. Fig. 2, and the diagrams, Figs. 3, 4, 5, 6, 8, 14, 21, 25, 26, 27, and 31, were also reproduced by the Photo-relief Company from drawings by Dr. McConnell. The fac-simile of the plate of Bassius, Fig. A, was made by the same company, and Fig. B was engraved from a photograph on wood of the cuts in different editions of the work of Gatinaria.

J. J. WOODWARD, *Surgeon, U. S. A.*

*A few of the balsam-mounted sections were made by Dr. E. M. Schaeffer, and the earlier sections, mounted in gum and glycerine, by Assistant Surgeon E. Curtis, U. S. A.

THE

# MEDICAL AND SURGICAL HISTORY

OF THE

# WAR OF THE REBELLION (1861-'65).

## PART II, VOLUME I.

BEING THE SECOND MEDICAL VOLUME.

## CLASS I.—ZYMOTIC DISEASES.

### CHAPTER I.—DIARRHŒA AND DYSENTERY.

#### SECTION I.—STATISTICAL REMARKS.

The various forms of flux which appeared among the troops during the war were recorded on the monthly reports of sick and wounded under four headings—Acute Diarrhœa, Chronic Diarrhœa, Acute Dysentery, and Chronic Dysentery. These disorders occurred with more frequency and produced more sickness and mortality than any other form of disease. They made their appearance at the very beginning of the war, not unfrequently prevailing in new regiments before their organization was complete, and although as a rule comparatively mild at first, were not long in acquiring a formidable character. Soon no army could move without leaving behind it a host of the victims. They crowded the ambulance trains, the railroad cars, the steamboats. In the general hospitals they were often more numerous than the sick from all other diseases, and rivalled the wounded in multitude. They abounded in the convalescent camps, and formed a large proportion of those discharged the service for disability. The majority of our men who were so unfortunate as to fall into the hands of the enemy suffered from these affections. Finally, for many months after the cessation of the war, and after the greater portion of the troops had returned to their homes, deaths from chronic diarrhœa and dysentery contracted in the service continued to be of frequent occurrence among them.

TOTAL NUMBER OF CASES AND DEATHS.—The total number of cases and deaths reported is shown by the following tabular statement:*

| | WHITE TROOPS, FROM MAY 1, 1861, TO JUNE 30, 1866. | | COLORED TROOPS, FROM JULY 1, 1863, TO JUNE 30, 1866. | | TOTAL. | |
|---|---|---|---|---|---|---|
| | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. |
| Acute Diarrhœa | 1,155,226 | 2,923 | 113,801 | 1,368 | 1,269,027 | 4,291 |
| Chronic Diarrhœa | 170,488 | 27,558 | 12,098 | 3,278 | 182,586 | 30,836 |
| Acute Dysentery | 233,812 | 4,084 | 25,259 | 1,492 | 259,071 | 5,576 |
| Chronic Dysentery | 25,670 | 3,229 | 2,781 | 626 | 28,451 | 3,855 |
| Total | 1,585,196 | 37,794 | 153,939 | 6,764 | 1,739,135 | 44,558 |

Large as these figures appear, they do not represent the full amount of mischief due to diarrhœa and dysentery, even in that portion of the army which is represented by the statistical tables. Certainly very many of the cases reported as enteritis or inflammation of the bowels belong to the same category, a circumstance which naturally resulted from pathological views very prevalent in the United States at the time. Table C reports 5,702 cases and 940 deaths of inflammation of the bowels among the white troops, and table CXI gives 748 cases with 193 deaths among the colored troops. It is, moreover, indisputable that a certain number of the deaths reported under various other headings were indirectly due to diarrhœa or dysentery, the fatal disorder occurring as a complication of the intestinal lesion, or its issue being determined by the general exhaustion resulting from a protracted flux. Thus, no doubt, many of the deaths ascribed to peritonitis, hæmorrhage from the bowels, jaundice, pneumonia, anæmia, debility, and some other diseases, belong to this category. The actual number of such cases cannot be estimated even approximately, and the same may be said of those which originated in the general hospitals themselves, among the patients admitted with other diseases, and among the physicians, nurses, and attendants.

The existence of these erroneously reported and unrecorded cases should not be overlooked; but even if we consider only the number of cases and deaths from diarrhœa and dysentery as actually reported, the magnitude of the evil is sufficiently apparent. The number taken on sick report with these diseases was to the total of all diseases reported about as one to every three and one-half for the white troops, and as one to every four for the colored troops. The number of deaths from diarrhœa and dysentery recorded in the tables constitute about the same proportion of the whole number of deaths from disease, viz: one to three and one-half among the white, one to four among the colored troops. These rates must be regarded as under-stating rather than exaggerating the proportion of deaths due to diarrhœa and dysentery. Assuming them to be approximately true, the total number of deaths from these disorders during the war may be computed as follows: The 37,794 deaths of white troops contained in the tabular statement above given represent the deaths from diarrhœa and dysentery out of a total number of 129,386 deaths in which

* See Part I, Volume I, Tables C and CXI.

the disease is specified. But it has been shown in the Introduction to the First Medical Volume* that 157,001 white soldiers are known to have died from disease, and that there were also 23,317 deaths the causes of which are not recorded. If it is assumed that these deaths from unrecorded causes were distributed between disease and wounds in the same proportion as those in which the cause is recorded, viz: one and seven-tenths deaths from disease to each death from wounds, 14,700 deaths from disease must be added to the number just given, making a total of 171,701 deaths from disease among white troops, 42,318 of which are simply reported as dead of disease, without the particular disease being specified. If it is supposed that the deaths from diarrhœa and dysentery among these deaths from unspecified diseases bear the same proportion they do in the case of those deaths in which the particular disease is recorded, viz: one to three and one-half, 12,091 deaths from these disorders must be added to the number already given, making a total of 49,885 deaths from diarrhœa and dysentery among the white troops. This estimate is probably considerably less than the actual number, for among the 42,318 deaths just referred to, the deaths from disease among the Union prisoners of war are included; and it will be shown hereafter that among them the deaths from diarrhœa and dysentery bore a much larger proportion to the total number of deaths than that given above.

The 6,764 deaths among colored troops embraced in the table represent the deaths from diarrhœa and dysentery out of a total of 27,499 deaths in which the disease is specified. It has been shown in the Introduction to the First Medical Volume† that the total number of deaths from disease among colored troops was 29,212; that the proportion of deaths from disease to deaths from wounds was eight and eight-tenths to one; and that there were 837 deaths from unknown causes. Dividing these deaths from unknown causes between disease and wounds in the same proportion as those from known causes, and adding, the total number of deaths from disease is found to be 29,964, of which 2,465 are not distributed among the particular diseases. If the proportion of deaths from diarrhœa and dysentery was the same among these as among the others, viz: one to four, 616 deaths must be added to the number given above, making a total of 7,380 deaths from these disorders among the colored troops. Adding this number to the deaths among white troops, as estimated above, gives 57,265 as the number of deaths from diarrhœa and dysentery in the Federal armies during the war; and even this, for the reasons indicated, must be regarded as less than the actual mortality from these diseases.

It is more difficult to approximate the number actually discharged the service from the same causes. The reports of the discharges on surgeon's certificate of disability give 17,389 white and 359 colored soldiers discharged for diarrhœa and dysentery,‡ being about one-eighth of the white and one-fifteenth of the colored soldiers discharged for disease in whose cases the nature of the disability is recorded. These figures, however, can hardly approximate the true proportion even as closely as those which represent the mortality from these diseases. The same table gives 14,500 white and 510 colored soldiers discharged for debility, and it is well known that a large number of these were suffering from chronic fluxes. So also were a certain proportion of those discharged for rheumatism, heart disease, anæmia, dropsy, inflammation of the liver, &c. Moreover, at the close of the war many thousands of diarrhœal patients, sick in the general hospitals, were mustered out of service and permitted to go to their homes, so that their names do not appear on the lists of those discharged on surgeon's certificate of disability.

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* Page XXXVIII. † Loc. cit. ‡ See Part I, Volume I Tables CI and CXII.

To complete this general review of the losses from diarrhœa and dysentery, some allusion must be made in this place to their occurrence among the Indians employed in the United States service during the war. There were three regiments of these troops, known as the first, second, and third Indian Home Guards. These three regiments each consisted originally of about a thousand officers and men. The enlisted men and many of the officers were semi-civilized Indians, recruited as volunteers in the Indian territory. They were mustered into service during 1862: the first at Leroy, Kansas, in May; the second at Big Creek and Five Mile Run, Kansas, during June and July; and the third at Carthage, Missouri, in September. All were mustered out of service May 31, 1865. They served chiefly in Indian territory and the adjoining region. There are on file no monthly reports of sick and wounded from any of them before October, 1862, and none from the first and second before December, 1862. For a number of months in 1863, and some in 1864, there are no reports. The reports on file represent twenty-five months for the first regiment, twenty-three for the second, and thirty-one for the third. The whole number of cases of diarrhœa and dysentery embraced in the reports is 1,567. Owing to the absence of so many reports this is, of course, much less than the real number of cases, but, taking the number of cases and the mean strengths for the months reported, the annual ratios of cases per 1,000 of mean strength are 252 for the first, 308 for the second, and 387 for the third regiment.

The monthly reports of the three regiments contain only twenty-four deaths from these diseases; but others occurred, both during the months for which there are no reports, and among men sent away from the regiments to hospital. The alphabetical registers of the Surgeon General's Office, compiled from all available sources, contain in all thirty-one deaths from diarrhœa and dysentery of men belonging to these regiments. Even this number, however, is less than the truth. Still, notwithstanding the imperfection of the reports, there is enough on record to show that the proportion of cases and deaths among these Indian troops was much less than among either the colored or the white troops in the Central region; both, however, are considerably greater than the ratios for white troops in the Pacific region, which will be presently presented. Owing to the incompleteness of the reports no table of the sickness and mortality of these three Indian regiments was presented in the statistical volume of this work.

There was, besides, a small number of Indians enlisted in other organizations, as for instance in the 42d Pennsylvania Volunteers; but reports of the sickness and mortality among them are not on file.

In the considerations next to be presented, attention will be directed to the white and colored troops only, without further reference to the incomplete data relating to the Indians.

Comparative Number and Mortality of Acute and Chronic Cases.—An examination of the tabular statement already given (page 2) shows the following proportion between the number of acute and chronic cases: For white troops, one case of chronic to every six of acute diarrhœa, and one case of chronic to every nine of acute dysentery. For colored troops, one case of chronic to every nine of acute diarrhœa, and one of chronic to every nine of acute dysentery. It must, however, be remembered that the number of acute cases, especially those of acute diarrhœa, is considerably larger than the actual number of individual soldiers taken sick. It is well known that the soldier who has apparently recovered

from an attack of acute diarrhœa is peculiarly liable to subsequent inroads of the same disease, and the attacks are repeated with ever-increasing frequency, until at last the flux becomes continued and the case is reported as chronic. The same circumstance occurs in the case of acute dysentery, though here the chronic cases more frequently result from the first attack. On the other hand, chronic cases being more or less continuous, the proportion of individual soldiers to the whole number of cases is larger. This circumstance must also be borne in mind in considering the comparative mortality of the acute and chronic cases. The tabular statement under consideration gives the following results: For white troops, one death to every three hundred and ninety-five cases of acute diarrhœa; one to every fifty-seven cases of acute dysentery; one to every six of chronic diarrhœa; and one to every eight of chronic dysentery. For colored troops, one death to every eighty-three cases of acute diarrhœa; one to every seventeen of acute dysentery; one to every four of chronic diarrhœa; and one to every four and one-half of chronic dysentery.

Here it is to be remembered also that the greater part of the chronic cases occurred in soldiers previously reported with the acute forms, so that in estimating the severity of the acute cases not merely the deaths, but the number of chronic cases must be considered. Moreover, the method pursued in constructing the statistical tables contained in the First Medical Volume, from which the figures under consideration are derived, must not be forgotten. Had it been possible to obtain complete reports of sick and wounded from all the troops in the field, the field reports would have embraced all the cases sent to general hospital. It has already been shown that this, unfortunately, was not the case, and that the field reports from which the number of cases is derived were always more or less incomplete. It was not possible to supplement these reports by tabulating the cases admitted to the general hospitals on account of the frequent transfers from hospital to hospital, which would have led to a duplication of cases.* But the tables embrace all the deaths reported in general hospital as well as the deaths in the field, and the list of deaths in hospital being much more nearly complete than the report of cases in the field, it follows that the ratios just given overstate somewhat the proportion of deaths among the chronic cases.

It is to be remarked further, that while the ratios just presented may be regarded as giving an approximate notion of the greater mortality of acute diarrhœa as compared with acute dysentery, a similar value cannot be attributed to the ratios for the chronic cases. It will be shown hereafter that the greater part of the cases reported by some surgeons as chronic diarrhœa, and by others as chronic dysentery, were in fact of the same nature. Numerous records of *post-mortem* examinations show that the disease generally called chronic diarrhœa was an affection of the large intestine, which was thickened, softened, and ulcerated, or covered with pseudo-membrane, or both; that in short the lesions in the cases reported as chronic diarrhœa were identical with those observed in the cases reported as chronic dysentery. Considerable diversity of opinion has always existed as to just where the line between diarrhœa and dysentery should be drawn, and this has been the case to a certain extent even with regard to the acute as well as the chronic cases. These diversities of opinion will be commented upon in a subsequent portion of this chapter. They are alluded to at present as the reason why it has been

* See Introduction to the Medical Volume of Part I, page XXVII.

thought advisable to group diarrhœa and dysentery together in preparing the ratios which are next to be considered.

Increasing Severity of these Diseases as the War progressed.—An examination of the statistical tables contained in the First Medical Volume shows that among the white troops the severity of these diseases, as indicated by the ratio of the deaths both to cases and to mean strength, steadily increased during the progress of the war. The actual number of cases reported, and the ratio of cases to strength, was greatest during the second year of the war, but the mortality attained its maximum during the last.

*Total number of cases and deaths from diarrhœa and dysentery among white troops for each year, with the annual ratio per* 1,000 *of mean strength, and the number of cases to each death.*

| Year. | Number of Cases. | Number of Deaths. | Annual ratio of cases per 1,000 of mean strength. | Annual ratio of deaths per 1,000 of mean strength. | Number of cases to each death. |
|---|---|---|---|---|---|
| May and June, 1861 | 9,772 | 4 | | | |
| Year ending June 30, 1862 | 215,058 | 1,205 | 770 | 4.17 | 178 |
| Year ending June 30, 1863 | 521,879 | 10,554 | 850 | 15.99 | 49 |
| Year ending June 30, 1864 | 395,720 | 10,661 | 639 | 15.78 | 37 |
| Year ending June 30, 1865 | 393,783 | 13,740 | 686 | 21.29 | 29 |
| Year ending June 30, 1866 | 48,984 | 1,630 | 494 | 16.00 | 30 |

It will be observed that the ratio of deaths to strength during the second and third years of the war is about four times that of the first year; during the fourth year it was more than five times as great; and during the year following the war the mortality again diminished to about what it had been during the second and third years. It will also be seen, from the number of cases to each death as presented in the table, that the proportion of deaths to cases during the last year of the war was six times greater than it was during the first, and that the diminished mortality during the year following the war was due to a diminution in the number rather in the severity of the cases.

As 30,787 of the 37,794 deaths among white troops embraced in the tables occurred among the chronic cases, it is, of course, to the increased number and severity of these that we are chiefly to look for an explanation of the increasing mortality. It will be found, by comparing the number of cases to one death for each year, that the acute cases also became more severe as the war progressed. They remained, however, comparatively mild throughout. The facts are given in detail in the following table, which shows that while the number of acute cases to each death steadily diminished during the war, and indeed during the year following the war, it was never large, the mortality at the maximum being but about one per cent. of the cases. Not so with the chronic forms; the mortality, which was about one death to twenty-nine cases during the first year, increased during the second to one death to eight and one-half cases; during the third, it was nearly one to six; during the fourth, one to four; and during the year following the war, remained one to less than five, although during this year the number of cases, and, therefore, the number of deaths, diminished greatly.

*Annual number of cases and deaths among white troops from the several forms of diarrhœa and dysentery.*

| | Year ending June 30, 1862. | | Year ending June 30, 1863. | | Year ending June 30, 1864. | | Year ending June 30, 1865. | | Year ending June 30, 1866. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. |
| Acute Diarrhœa | 164,411 | 230 | 381,879 | 911 | 280,796 | 620 | 284,580 | 973 | 35,095 | 159 |
| Acute Dysentery | 32,220 | 338 | 66,490 | 967 | 61,276 | 1,242 | 61,470 | 1,248 | 8,362 | 286 |
| Total acute | 196,631 | 568 | 448,369 | 1,908 | 345,072 | 1,862 | 346,050 | 2,221 | 43,457 | 445 |
| No. of acute cases to one death | 346.2 | | 235. | | 185.3 | | 155.8 | | 97.7 | |
| Chronic Diarrhœa | 15,815 | 501 | 64,531 | 7,556 | 43,477 | 7,868 | 41,574 | 10,600 | 4,827 | 1,033 |
| Chronic Dysentery | 2,609 | 136 | 8,979 | 1,090 | 7,171 | 931 | 6,159 | 919 | 700 | 152 |
| Total chronic | 18,424 | 637 | 73,510 | 8,646 | 50,648 | 8,799 | 47,733 | 11,519 | 5,527 | 1,185 |
| No. of chronic cases to one death | 28.9 | | 8.5 | | 5.7 | | 4.1 | | 4.7 | |

The comparatively small number of chronic cases during the first year of the war will readily be understood. Undoubtedly cases occurred among the feeble and susceptible in a comparatively short time after they entered the service; but, as a rule, they occurred among those who were healthy and robust at the time of enlistment only after they had been exposed for a considerable time to the morbific influences of camp life, and generally not until they had suffered from repeated acute attacks. That the mortality continued so high during the year following the war resulted, undoubtedly, from the circumstance that there were so many men still in service who had contracted the disease, or at least laid the foundation for it, during the exposures of previous years.

In the case of the colored troops a similar increase in the total mortality from diarrhœa and dysentery with the progress of the war is not observed. The ratio of deaths to strength is, in fact, greatest during the first year represented by the returns, and diminished during subsequent years.

*Total number of cases and deaths from diarrhœa and dysentery among colored troops for each year, with the annual ratio per* 1,000 *of mean strength, and the number of cases to each death.*

| Year. | Number of Cases. | Number of Deaths. | Annual ratio of cases per 1,000 of mean strength. | Annual ratio of deaths per 1,000 of mean strength. | Number of cases to each death. |
|---|---|---|---|---|---|
| Year ending June 30, 1864 | 46,572 | 2,003 | 1,040 | 43.54 | 23 |
| Year ending June 30, 1865 | 73,976 | 3,235 | 885 | 36.29 | 23 |
| Year ending June 30, 1866 | 33,391 | 1,526 | 607 | 26.97 | 22 |

At first sight these results would appear to invalidate the explanation of the steadily increasing mortality from diarrhœa and dysentery among the white troops which has just been offered, but, in fact, the circumstances under which most of the colored troops were first mustered into service were very different from those which surrounded the white. The recruits were largely found among the escaped slaves who accumulated in large numbers within the lines of our armies, and who had suffered much from exposure and privation before they enlisted. Moreover, from want of discipline and other causes, the hygienic conditions which at first prevailed in their camps were of the most unfavorable character. With subsequent improvement in the discipline and hygienic management of the colored troops the mortality from diarrhœa and dysentry progressively diminished. This view is confirmed by the circumstance that the total mortality from disease among the colored troops was also proportionately greatest during the year ending June 30, 1864, and subsequently diminished in like manner.* Accordingly we find, as might be expected, a much greater proportional mortality of the acute cases among the colored troops than among the white, no less than 2,860 of the 6,764 deaths among colored troops embraced in the tables being from the acute form. The following table gives the facts for each year:

*Annual number of cases and deaths among colored troops from the several forms of diarrhœa and dysentery.*

| | Year ending June 30, 1864. | | Year ending June 30, 1865. | | Year ending June 30, 1866. | |
|---|---|---|---|---|---|---|
| | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. |
| Acute Diarrhœa | 34,851 | 503 | 54,586 | 608 | 24,364 | 257 |
| Acute Dysentery | 7,215 | 496 | 12,239 | 584 | 5,805 | 412 |
| Total acute | 42,066 | 999 | 66,825 | 1,192 | 30,169 | 669 |
| Number of acute cases to one death | 42.1 | | 56. | | 45. | |
| Chronic Diarrhœa | 3,659 | 784 | 5,905 | 1,788 | 2,534 | 706 |
| Chronic Dysentery | 847 | 220 | 1,246 | 255 | 688 | 151 |
| Total chronic | 4,506 | 1,004 | 7,151 | 2,043 | 3,222 | 857 |
| Number of chronic cases to one death | 4.5 | | 3.5 | | 3.8 | |

It appears from this table that during the year ending June 30, 1864, there was one death out of every forty-two acute cases; during the next year, the mortality diminished to one out of fifty-six; during the year following the war, it rose again to one out of forty-five. The chronic cases, on the other hand, were less fatal during the first year represented in the reports than subsequently. One died out of every four and one-half during the year ending June 30, 1864; one out of every three and one-half during the next year; and very nearly the same proportion during the year following the war.

* See Part I, Volume I, Table CXI.

Influence of Region on the Number of Cases and Deaths.—Diarrhœa and dysentery were more frequent and fatal among the troops in the Central region, less so in the Atlantic, and least in the Pacific region. This difference exists in the case of the colored troops as well as the white, and is even more striking in connection with the mortality than the number of cases. Thus among the white troops the average annual mortality from July 1, 1861, to June 30, 1866, was in round numbers one per 1,000 of mean strength for the Pacific region, ten for the Atlantic region, and twenty-one for the Central region,—the proportionate mortality being ten times greater in the Atlantic than in the Pacific region, and more than twice greater in the Central region than in the Atlantic. In the case of the colored troops the average annual mortality from July 1, 1863, to June 30, 1866, was twenty-three per 1,000 in the Atlantic region, and forty per 1,000 in the Central, being nearly twice greater in the latter than in the former. The following table presents the annual results in each region for the white troops:

*Annual number of cases and deaths among white troops from diarrhœa and dysentery in each of the three regions, with the ratio per* 1,000 *of strength, and the number of cases to each death.*

| Year. | Atlantic Region. | | | | | Central Region. | | | | | Pacific Region. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cases. | Deaths. | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. | No. of cases to one death. | Cases. | Deaths. | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. | No. of cases to one death. | Cases. | Deaths. | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. | No. of cases to one death. |
| Year ending June 30, 1862.. | 106,447 | 195 | 618 | 1.10 | 546.0 | 106,672 | 1,005 | 1,068 | 9.56 | 106.1 | 1,937 | 5 | 271 | 0.70 | 387.4 |
| Year ending June 30, 1863.. | 231,812 | 2,796 | 810 | 8.91 | 82.9 | 287,498 | 7,750 | 902 | 23.00 | 37.1 | 2,569 | 8 | 274 | 0.85 | 321.2 |
| Year ending June 30, 1864.. | 136,121 | 2,010 | 616 | 8.06 | 67.7 | 257,670 | 8,644 | 663 | 20.80 | 29.8 | 1,929 | 7 | 184 | 0.67 | 275.6 |
| Year ending June 30, 1865.. | 166,240 | 5,634 | 682 | 19.59 | 29.5 | 224,884 | 8,093 | 706 | 23.38 | 27.7 | 2,659 | 13 | 225 | 1.10 | 204.5 |
| Year ending June 30, 1866.. | 16,358 | 537 | 446 | 14.18 | 30.4 | 29,837 | 1,067 | 584 | 20.25 | 27.9 | 2,789 | 26 | 246 | 2.29 | 107.2 |

An examination of this table shows that in the Atlantic region the ratio of mortality to strength was nearly nine times greater during the second than it was during the first year of the war; during the third year it was slightly less than during the second; while during the fourth or last year of the war it was more than twice as great as during the second and third, approaching, in fact, the mortality rate of the Central region. The year following the war the ratio again fell off, yet continued higher than it had been before the last year. The causes of the heavy mortality in the Atlantic region during the year ending June 30, 1865, are undoubtedly to be sought, in part at least, in the exposures and privations of the severe military operations of the year, particularly those of the army of the Potomac, which operated most of the year in the unhealthy region before Petersburg, Virginia, and contributed by far the greatest portion of the cases and deaths.

In the Central region the mortality was large from the first, amounting to nearly one per cent. of the strength for the first year; during the second year this rate was more than doubled, but afterward there was no material increase. The ratio for the third year was three per 1,000 less than that of the second, and the increase during the last year of the war only made the ratio a fraction greater than that attained during the second year. The increased mortality for the whole army, already mentioned as characterizing the last year of the war, was therefore chiefly due to the increase in the Atlantic region.

During the year following the war the ratio of mortality in the Central region diminished a little, but not quite so much as in the Atlantic region.

In the Pacific region the mortality was very small throughout. It will be observed, however, that the ratio is doubled during the year following the war. The increase was due chiefly to the transfer of troops from the other regions. Twelve of the twenty-six deaths are known to have been among soldiers thus transferred.

The following table presents the annual results in each region for the colored troops:

*Annual number of cases and deaths from diarrhœa and dysentery among colored troops in the Atlantic and Central regions, with the ratio per* 1,000 *of strength, and the number of cases to each death.*

| Year. | Atlantic Region. | | | | | Central Region. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cases. | Deaths. | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. | No. of cases to one death. | Cases. | Deaths. | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. | No. of cases to one death. |
| Year ending June 30, 1864 | 11,551 | 108 | 836 | 7.56 | 107.0 | 35,021 | 1,895 | 1,131 | 59.73 | 18.5 |
| Year ending June 30, 1865 | 26,375 | 987 | 923 | 31.23 | 26.7 | 47,601 | 2,248 | 865 | 39.07 | 21.2 |
| Year ending June 30, 1866 | 3,961 | 196 | 421 | 19.49 | 20.2 | 29,430 | 1,330 | 645 | 28.56 | 22.1 |

This table shows that in the Atlantic region the mortality followed the same general course among the colored troops as among the white. It was least during the first year represented in the tables, increased considerably during the next year, and materially diminished during the year following the war. It is in the Central region that the great mortality occurred during the year ending June 30, 1864, which determines the anomalous feature in the progress of the mortality from diarrhœa and dysentery among the colored troops, which was commented upon in a previous paragraph (page 8), and it is well known that it was in this region that the causes then mentioned existed in the highest degree. In the Central region also the mortality remained comparatively high during the year following the war; and it is worthy of note that an examination of the sick reports shows that it was higher among the colored troops in the state of Texas than in any other portion of the Central region. In that state the average strength of the colored troops during the year ending June 30, 1866, as represented by the sick reports, was 10,553; the number of deaths from diarrhœa and dysentery was 401, or 38 per 1,000 of mean strength. The average mean strength of the colored troops in the rest of the Central region, as represented by the reports, was 36,009, among whom there were 929 deaths from diarrhœa and dysentery, or 26 per 1,000 of mean strength. The chief cause of the greater mortality in the state of Texas was the existence of a well-marked scorbutic taint, and will be a subject of further comment hereafter. It should, however, be stated here that the mortality from the same diseases among the white troops in Texas during this year, though large, was not greater than in the rest of the Central region.

In Circular No. 6 the opinion was expressed that cases of diarrhœa and dysentery were more fatal when treated in Southern than in Northern hospitals, and the attempt was made to give a numerical expression to this opinion, especially with regard to the chronic cases treated in the general hospitals during the second year of the war. (Circular

No. 6, page 122.) Subsequent investigation has shown that the figures there given can only be regarded as rough approximations. They were deduced from the monthly reports of sick and wounded by comparing the number of deaths with the number of admissions, without taking into account the transfers to other hospitals, the total number of which only was given in the reports, without specifying the diseases of the men transferred. Hence, the proportion of cases to deaths appears larger than it really was.

The original registers of the general hospitals having been turned in to the Surgeon General's Office after the close of the war, afford the means of obtaining more accurate information; but it would involve a greater amount of clerical labor than it has been found possible to devote to the purpose to make an exhaustive analysis of their contents. Under the circumstances it has only been feasible to select a few representative hospitals out of the whole number. The original registers of these have been gone over name by name, and from the total number of cases of diarrhœa and dysentery admitted all transfers to other hospitals have been subtracted, and the number of deaths and discharges on surgeon's certificate of disability compared with the remainder, thus giving a just notion of the relative mortality from the diseases under consideration in each of the hospitals named. The results thus obtained are of course not so satisfactory as if it had been possible to treat the records of all the general hospitals in the same manner, still they are sufficient to show that while the opinion expressed in Circular No. 6 is in a general way correct, other circumstances than the influences of latitude gravely modified the results.

In the Atlantic region the records of seventeen general hospitals have been analyzed in the manner just indicated, with the following results:

The records of the hospital at Burlington, Vermont, extend from April 23, 1862, to July 4, 1865. During this period 412 admissions from diarrhœa and dysentery were recorded, of whom 14 were transferred to other hospitals, 13 died, and 35 were discharged on surgeon's certificate of disability. Deducting the cases transferred from the whole number of admissions, there was one death out of every 30.6 cases treated in the hospital, and one discharge out of every 11.4 cases.

The records of the hospital at Brattleboro', Vermont, extend from January, 1862, to August 31, 1865. During this period 802 admissions from diarrhœa and dysentery were recorded, of whom 317 were transferred to other hospitals, 39 died, and 21 were discharged for disability. Omitting the number transferred, there was one death to every 12.5 cases, and one discharge to every 23.1 cases.

The records of the Cony hospital, Augusta, Maine, extend from June 3, 1864, to November 29, 1865. During this period 408 admissions from diarrhœa and dysentery were recorded, of whom 19 were transferred to other hospitals, 27 died, and 98 were discharged for disability. Omitting the number transferred, there was one death to every 14.4 cases, and one discharge to every 4.1 cases.

The records of the Knight hospital, New Haven, Connecticut, extend from June 9, 1862, to November, 1865. During this period 757 admissions from diarrhœa and dysentery were recorded, of whom 106 were transferred to other hospitals, 37 died, and 139 were discharged for disability. Omitting the number transferred, there was one death to every 17.6 cases, and one discharge to every 4.7 cases.

The records of the Lovell hospital, Portsmouth Grove, Rhode Island, extend from

July, 1862, to October, 1865. During this period 943 admissions from diarrhœa and dysentery were recorded, of whom 270 were transferred to other hospitals, 95 died, and 134 were discharged for disability. Omitting the number transferred, there was one death to every 7.1 cases, and one discharge to every 5 cases.

The records of the Ira Harris hospital, Albany, New York, extend from June 21, 1862, to December 30, 1865. During this period 523 admissions from diarrhœa and dysentery were recorded, of whom 75 were transferred to other hospitals, 33 died, and 189 were discharged for disability. Omitting the number transferred, there was one death to every 13.6 cases, and one discharge to every 2.3 cases.

The records of the McDougall hospital, Fort Schuyler, New York harbor, extend from October 10, 1862, to September 16, 1865. The hospital was closed temporarily from January 20 to May 24, 1864. During the whole period 2,193 admissions from diarrhœa and dysentery were recorded, of whom 691 were transferred to other hospitals, 207 died, and 270 were discharged for disability. Omitting the number transferred, there was one death to every 7.3 cases, and one discharge to every 5.6 cases.

The records of the De Camp hospital, David's Island, New York harbor, extend from May 22, 1862, to December 2, 1866. During this period 3,969 admissions from diarrhœa and dysentery were recorded, of whom 1,148 were transferred to other hospitals, 522 died, and 200 were discharged for disability. Omitting the number transferred, there was one death to every 5.4 cases, and one discharge to every 14.1 cases.

The records of the Mower hospital, Philadelphia, Pennsylvania, extend from December 24, 1862, to November 15, 1865. During this period 2,671 admissions from diarrhœa and dysentery were recorded, of whom 509 were transferred to other hospitals, 106 died, and 161 were discharged for disability. Omitting the number transferred, there was one death to every 20.4 cases, and one discharge to every 13.43 cases.

The records of the Satterlee hospital, West Philadelphia, extend from June, 1862, to September, 1865. During this period 2,128 admissions from diarrhœa and dysentery were recorded, of whom 270 were transferred to other hospitals, 124 died, and 337 were discharged for disability. Omitting the number transferred, there was one death to every 14.9 cases, and one discharge to every 5.5 cases.

The records of the Jarvis hospital, Baltimore, Maryland, extend from June 20, 1862, to July 25, 1865. During this period 1,637 admissions from diarrhœa and dysentery were recorded, of whom 792 were transferred to other hospitals, 122 died, and 63 were discharged for disability. Omitting the number transferred, there was one death to every 6.9 cases, and one discharge to every 13.4 cases.

The records of the Harewood hospital, Washington, D. C., extend from September, 1862, to May 1, 1866. During this period 2,803 admissions from diarrhœa and dysentery were recorded, of whom 991 were transferred to other hospitals, 186 died, and 122 were discharged for disability. Omitting the number transferred, there was one death to every 9.7 cases, and one discharge to every 14.9 cases.

The records of the Lincoln hospital, Washington, D. C., extend from December 23, 1862, to August 8, 1865. During this period 2,937 admissions from diarrhœa and dysentery were recorded, of whom 1,090 were transferred to other hospitals, 244 died, and 129 were discharged for disability. Omitting the number transferred, there was one death to every 7.6 cases, and one discharge to every 14.3 cases.

The records of the hospital at Annapolis, Maryland, extend from January 20, 1861, to May 21, 1865. During this period 5,305 admissions from diarrhœa and dysentery were recorded, of whom 1,733 were transferred to other hospitals, 1,055 died, and 113 were discharged for disability. Omitting the number transferred, there was one death to every 3.5 cases, and one discharge to every 31.6 cases.

The records of the Hampton hospital, Fortress Monroe, Virginia, extend from August 18, 1862, to May 1, 1866. During this period 5,258 admissions from diarrhœa and dysentery were recorded, of whom 1,668 were transferred to other hospitals, 806 died, and 303 were discharged for disability. Omitting the number transferred, there was one death to every 4.5 cases, and one discharge to every 11.8 cases.

The records of the Foster hospital, Newbern, North Carolina, extend from August 22, 1862, to October 31, 1865. During this period 2,289 admissions from diarrhœa and dysentery were recorded, of whom 1,115 were transferred to other hospitals, 133 died, and 41 were discharged for disability. Omitting the number transferred, there was one death to every 8.8 cases, and one discharge to every 28.6 cases.

The records of the Hilton Head hospital, South Carolina, extend from March 1, 1862, to October 12, 1866. During this period 1,781 admissions from diarrhœa and dysentery were recorded, of whom 449 were transferred to other hospitals, 185 died, and 111 were discharged for disability. Omitting the number transferred, there was one death to every 7.2 cases, and one discharge to every 12 cases.

The records of fourteen hospitals situated in the Central region have been analyzed in the same manner, with the following results:

The records of the Harvey hospital, Madison, Wisconsin, extend from October 27, 1863, to September 4, 1865. During this period 779 admissions from diarrhœa and dysentery were recorded, of whom 103 were transferred to other hospitals, 32 died, and 284 were discharged for disability. Omitting the number transferred, there was one death to every 21.1 cases, and one discharge to every 2.4 cases.

The records of the hospital at Keokuk, Iowa, extend from April 20, 1862, to September 30, 1865. During this period 1,169 admissions from diarrhœa and dysentery were recorded, of whom 188 were transferred to other hospitals, 110 died, and 55 were discharged for disability. Omitting the number transferred, there was one death to every 8.9 cases, and one discharge to every 17.8 cases.

The records of the Benton Barracks hospital, St. Louis, Missouri, extend from July, 1861, to May, 1865. During this period 2,794 admissions from diarrhœa and dysentery were recorded, of whom 516 were transferred to other hospitals, 154 died, and 186 were discharged for disability. Omitting the number transferred, there was one death to every 14.7 cases, and one discharge to every 12.8 cases.

The records of the Marine hospital, St. Louis, Missouri, extend from May 4, 1862, to June, 1866. During this period 920 admissions from diarrhœa and dysentery were recorded, of whom 103 were transferred to other hospitals, 100 died, and 97 were discharged for disability. Omitting the number transferred, there was one death to every 8.2 cases, and one discharge to every 8.4 cases.

The records of the Jefferson Barracks hospital, St. Louis, Missouri, extend from April 30, 1862, to November 21, 1865. During this period 6,225 admissions from diarrhœa and dysentery were recorded, of whom 1,480 were transferred to other hospitals, 912 died,

and 1,334 were discharged. Omitting the number transferred, there was one death to every 5.2 cases, and one discharge to every 3.6 cases.

The records of the hospital at Cairo, Illinois, extend from April 21, 1861, to June 19, 1865. During this period 2,344 admissions from diarrhœa and dysentery were recorded, of whom 175 were transferred to other hospitals, 293 died, and 90 were discharged for disability. Omitting the number transferred, there was one death to every 7.4 cases, and one discharge to every 24.1 cases.

The records of the Camp Dennison hospital, near Cincinnati, Ohio, extend from November, 1862, to October 27, 1865. During this period 2,439 admissions from diarrhœa and dysentery were recorded, of whom 273 were transferred to other hospitals, 79 died, and 431 were discharged for disability. Omitting the number transferred, there was one death to every 27.4 cases, and one discharge to every 5 cases.

The records of the hospital at Madison, Indiana, extend from June 24, 1863, to August, 1865. During this period 1,514 admissions from diarrhœa and dysentery were recorded, of whom 369 were transferred to other hospitals, 74 died, and 165 were discharged for disability. Omitting the number transferred, there was one death to every 15.5 cases, and one discharge to every 6.9 cases.

The records of the Jefferson hospital, Jeffersonville, Indiana, opposite Louisville, Kentucky, extend from February 23, 1864, to December, 1865. During this period 3,036 admissions from diarrhœa and dysentery were recorded, of whom 1,488 were transferred to other hospitals, 213 died, and 18 were discharged for disability. Omitting the number transferred, there was one death to every 7.3 cases, and one discharge to every 86 cases.

The records of the Brown hospital, Louisville, Kentucky, extend from September 3, 1862, to July 19, 1865. During this period 3,117 admissions from diarrhœa and dysentery were recorded, of whom 1,252 were transferred to other hospitals, 254 died, and 190 were discharged for disability. Omitting the number transferred, there was one death to every 7.3 cases, and one discharge to every 9.8 cases.

The records of the Cumberland hospital, Nashville, Tennessee, extend from May 17, 1864, to April 27, 1866. During this period 3,910 admissions from diarrhœa and dysentery were recorded, of whom 2,185 were transferred to other hospitals, 264 died, and 110 were discharged for disability. Omitting the number transferred, there was one death to every 6.5 cases, and one discharge to every 15.7 cases.

The records of the Gayoso hospital, Memphis, Tennessee, extend from March 3, 1863, to November 25, 1865. During this period 1,726 admissions from diarrhœa and dysentery were recorded, of whom 457 were transferred to other hospitals, 313 died, and 142 were discharged for disability. Omitting the number transferred, there was one death to every 4 cases, and one discharge to every 8.9 cases.

The records of the Barracks hospital, New Orleans, Louisiana, extend from January 1, 1863, to November 26, 1865. During this period 3,540 admissions from diarrhœa and dysentery were recorded, of whom 537 were transferred to other hospitals, 560 died, and 359 were discharged for disability. Omitting the number transferred, there was one death to every 5.2 cases, and one discharge to every 8.1 cases.

The records of the Marine hospital, New Orleans, Louisiana, extend from August 9, 1862, to June 29, 1865. During this period 3,268 admissions from diarrhœa and dysentery were recorded, of whom 779 were transferred to other hospitals, 632 died, and 457 were

discharged for disability. Omitting the number transferred, there was one death to every 3.9 cases, and one discharge to every 5.1 cases.

An examination of the comparative mortality of diarrhœa and dysentery in the above hospitals in the Atlantic region, during the whole term of their existence, does not show any such evident relationship between latitude and mortality as was indicated by the figures published in Circular No. 6 for the chronic cases during the second year of the war. There are several reasons for this circumstance. In the first place, the proportion of those who were discharged on surgeon's certificate of disability was very different in the different hospitals, and was, as a rule, determined by administrative considerations rather than by the gravity of the cases. Thus at Albany, New York, one case was discharged out of every 2.3; at the Foster hospital, North Carolina, only one out of every 28.6. Of course the more serious and obstinate chronic cases were generally those selected for discharge. Where such discharges were numerous, the proportionate mortality in the hospital would naturally be low; where similar cases were detained for treatment, the mortality would be high. The question of discharge did not depend merely upon the opinion or caprice of the surgeon in charge and his assistants. These were often supervised by inspectors, or by boards of medical officers, without whose approval no discharge could be granted. The action of such inspectors and boards depended upon administrative exigencies perhaps quite as often as upon the nature of the cases. Sometimes circumstances made it desirable to discharge every patient who might be expected to recover under the favorable influences of home. Sometimes military reasons made it seem imperative to retain in hospital every man whose recovery would have added a musket to the active armies.

Then, again, the transfers from hospital to hospital were of necessity chiefly determined by military reasons. Whenever the movement of a great army made it desirable to disembarrass it of the sick in the field hospitals, they were transferred to the nearest general hospitals; and when these became overcrowded, the patients thought best fitted to bear removal were transferred to hospitals at more remote points. Hence, as a rule, the very gravest cases remained at the hospitals nearest the active armies, and this is probably one important reason why the hospital at Fortress Monroe, which received so many cases directly from the army of the Potomac on the Peninsula, and the armies of the Potomac and of the James before Petersburg, gives so large a ratio. Still greater was the mortality at the Annapolis hospital, which, being conveniently situated on Chesapeake bay, not merely received large numbers of sick directly from the same army by steamboat, but was also the hospital selected for the treatment of the sick among the exchanged prisoners of war delivered to the United States authorities before Richmond. A large number of these men had long suffered with chronic diarrhœa or dysentery at Belle Isle and other Confederate prisons, were in the last stage of the disease when released, and died shortly after reaching Annapolis. For this reason the mortality at that place was greater than at the Fortress Monroe hospital, although the latter was nearer the base of operations.

The convenience of water transportation led also to the transfer of large numbers of sick by steamboat from the same army to such other hospitals as were readily accessible in this manner; for example, the Portsmouth Grove hospital, the hospitals in New York harbor, and the Baltimore hospitals; and, therefore, it is not surprising that the mortality in these hospitals was fully as great as it was in the Washington hospitals, which were

the base hospitals of the army of the Potomac during a large part of the war, and which continued to receive sick from that army by steamboat when it operated on the Peninsula and before Richmond.

The Philadelphia hospitals, on the other hand, received large numbers of patients by transfer from the hospitals of Fortress Monroe, Washington, and Baltimore, where they had been treated for a while, and where many of the worst cases were left, and chiefly from this reason, no doubt, the proportion of deaths among the diarrhœal cases in the Mower and Satterlee hospitals was about as small as it was in the inland New York and New England hospitals. In fact the investigation would seem to indicate that the more northern hospitals owed their comparatively small mortality as much to the fact that they received their patients by transfer from other hospitals, where a large part of the worst cases had been sifted out, as to their geographical position.

In the case of the hospitals south of Fortress Monroe, such as the Foster hospital and the Hilton Head hospital, the mortality was rendered much smaller than it would otherwise have been by the circumstance that obstinate chronic cases were very generally sent on hospital transports to the north, which, of course, not merely diminished the relative mortality in the hospitals of North and South Carolina, but increased that of those northern hospitals in New York harbor, Portsmouth Grove, and other points accessible by water, to which such patients were sent.

Similar transfers of vast numbers of patients from hospital to hospital occurred also in the Central region. Hospital steamboats were employed for the purpose on the Mississippi river and its tributaries, and the railroads were extensively used. Considerable numbers were also sent by sea from New Orleans to New York harbor and other northern points, and helped to swell the mortality of the hospitals there. Before the fall of Vicksburg this was the only way in which patients could be sent north from New Orleans.

Notwithstanding the interference of these transfers, it will be seen that, in the Central region, as a general rule, diarrhœal diseases were more fatal the more southern the situation of the hospital. The mortality from chronic diarrhœa and dysentery at the general hospital at Cairo, during the second year of the war, was stated in Circular No. 6 to have been greater than that at any other point in the Central region. This observation it will be seen does not hold good for the whole war, when the acute cases and deaths are also considered. It will be observed that the proportion of deaths at the Marine hospital, St. Louis, at Cairo, at Jeffersonville, and at the Brown hospital, Louisville, is very nearly the same; it is greater at the Cumberland hospital, Nashville, and still greater at the Gayoso hospital, Memphis, and the two New Orleans hospitals. The rate at Jefferson Barracks, St. Louis, is exceptionally large, if its geographical position alone is considered; that at Benton Barracks, St. Louis, and at Madison, Indiana, is exceptionally small.

In the Camp Dennison and Harvey hospitals the fatality of diarrhœal diseases was less than in any of the other hospitals in the Central region above mentioned. Both received their patients by transfer from the hospitals immediately upon the Ohio and Mississippi rivers. Steamboat transportation brought these latter into very similar relations with the great armies, which explains the fact that the fatality of the diarrhœal cases was about the same in most of them. The greater mortality in the Cumberland and Gayoso hospitals is partly explained by the fact that the Nashville and Memphis hospitals were so long the base hospitals of the western armies. One of the New Orleans

hospitals gives a greater, the other a less mortality than the Memphis hospital. Had the Mississippi river been open for the free transfer of the sick during the whole war, it is probable that in spite of the more southern situation of these hospitals they would, like the hospitals on the southern Atlantic coast, have had a smaller mortality than those situated nearer the chief arena of conflict.

It will be noticed that the difference in the proportion of patients discharged for disability in the different hospitals was as great in the Central as in the Atlantic region, amounting to one in 2.4 cases at Madison, Wisconsin, and only one in 86 at Jeffersonville, Indiana. At this latter hospital, however, the transfers to other hospitals were exceedingly numerous, amounting to about one-half of all the patients admitted with diarrhœa and dysentery.

The foregoing brief analysis of the records of a number of selected hospitals would seem to indicate that, even had it been possible to analyze all the hospital records in like manner, no very precise information as to the effect of latitude on the mortality from diarrhœa and dysentery could have been obtained from that source, the influence from this cause being masked by variations in the freedom with which discharges for disability were granted, by the frequent transfers from hospital to hospital, and by the neighborhood of individual hospitals to the seat of war. Moreover, these perturbing circumstances must have been still further complicated by strictly local conditions peculiar to each hospital; such as the nature of the hospital site, the character of the buildings, the amount of air-space afforded to each patient, and the general hygienic management of the establishment. It would be difficult to trace the influence of these conditions, unless the same class of patients had been received into every hospital; as it was, the causes determining the proportion of mortality in each case were too numerous for it to be possible to establish the exact part taken by each.

Something further may, it is true, be learned by comparing the annual ratio of cases in the several departments of each region. This has been done in the following tables for the Atlantic and Central regions, which have been compiled from the statistical tables of these departments in the First Medical Volume:

*Tabular statement of the prevalence of diarrhœa and dysentery in the several Departments in the Atlantic region, expressed in ratio per* 1,000 *of mean strength for each year.*

| Department. | Year ending June 30, 1862. | Year ending June 30, 1863. | Year ending June 30, 1864. | Year ending June 30, 1865. |
|---|---|---|---|---|
| Department of the East | ..... | 296 | 359 | 338 |
| Middle Department | 445 | 437 | 351 | 614 |
| Department of the Shenandoah | 569 | ..... | ..... | ..... |
| Middle Military Division | ..... | ..... | ..... | 606 |
| Department of Washington | ..... | 578 | 494 | 530 |
| Army of the Potomac | 640 | 995 | 558 | 708 |
| Department of Virginia | 451 | 748 | 802 | 903 |
| Department of North Carolina | 648 | 682 | 567 | 729 |
| Department of the South | 730 | 625 | 1,160 | 703 |

*Tabular statement of the prevalence of diarrhœa and dysentery in the several Departments in the Central region, expressed in ratio per* 1,000 *of mean strength for each year.*

| Department. | Year ending June 30, 1862. | Year ending June 30, 1863. | Year ending June 30, 1864. | Year ending June 30, 1865. |
|---|---|---|---|---|
| Department of the Northwest | 535 | 196 | 464 | 517 |
| Northern Department | ..... | 569 | 550 | 538 |
| Department of West Virginia | 696 | 480 | 323 | ..... |
| Department of the Missouri | 692 | 522 | 419 | 570 |
| Department of the Ohio | ..... | 569 | 560 | ..... |
| Department of the Cumberland | 1,084 | 1,017 | 627 | ..... |
| Department of the Tennessee | 1,469 | 944 | 764 | ..... |
| Military Division of the Mississippi, Part 1 | ..... | ..... | ..... | 747 |
| Military Division of the Mississippi, Part 2 | ..... | ..... | ..... | 620 |
| Department of Arkansas | ..... | ..... | 698 | 804 |
| Department of the Gulf | 1,637 | 1,473 | 963 | 872 |

In these tables it will be seen that the ratio of cases to strength is, as a rule, proportionately greater in the more southern departments. The exceptions are not numerous, and generally are the result of an increased number of cases in armies subjected to unusual privations or exposure by the exigencies of active campaigns. Similar ratios cannot be computed for the mortality of the several departments on account of the transfers of the patients in hospital from department to department; but as very generally, at least, an increased number of cases of diarrhœa and dysentery is accompanied by increased severity in the form of the disease prevailing, the tables have a certain value in indicating the influence of latitude, though it cannot be assumed that the mortality stands in any constant numerical relation to the number of cases.

Influence of Season.—The monthly ratios of cases to strength show that throughout the period represented by the tables, both among the white and the colored troops, and in the Pacific as well as in the Atlantic and Central regions, diarrhœa and dysentery were most frequent during the summer and autumn. Where marked deviations from this rule occur, they are generally explicable when the movements and operations of the great armies are taken into consideration.

The following tables give the monthly ratios of cases per 1,000 of mean strength among the white troops in each region. It must be borne in mind that the ratios are derived from the number taken on sick report monthly with diarrhœa and dysentery. They do not represent, therefore, the whole number sick with these diseases, but simply the new cases. The mean strengths used in computing the ratios include the troops in the field and in garrison in each region so far as they are represented in the reports. The sick in general hospitals are not included in the strength, because the cases among them are not represented in the reports.* The ratios for the year are not the sum of the monthly ratios, but are directly computed from the mean strength for the year and the total number of cases.

* The data from which these ratios are constructed will be found in the following tables: Atlantic region, Tables XII, XXXIII, LVI, LXXXII, XCVI; Central region, Tables XX, XLIII, LXVII, XCI, XCVII; Pacific region, Tables XXIII, XLVI, LXX, XCIV, XCVIII. Vol. I. Part I.

*Number taken on sick report each month with diarrhœa and dysentery among white troops, expressed in ratio per 1,000 of mean strength.*

*Year ending June 30, 1862.*

| Region. | 1861. | | | | | | 1862. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 167 | 115 | 70 | 63 | 46 | 29 | 23 | 22 | 35 | 62 | 64 | 79 | 618 |
| Central | 99 | 144 | 100 | 94 | 71 | 64 | 74 | 55 | 72 | 111 | 101 | 93 | 1,068 |
| Pacific | 28 | 38 | 29 | 30 | 28 | 13 | 11 | 16 | 18 | 17 | 24 | 36 | 271 |

*Year ending June 30, 1863.*

| Region. | 1862. | | | | | | 1863. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 128 | 88 | 104 | 110 | 73 | 62 | 58 | 45 | 38 | 32 | 58 | 60 | 810 |
| Central | 79 | 67 | 88 | 84 | 67 | 60 | 84 | 71 | 77 | 69 | 72 | 86 | 902 |
| Pacific | 40 | 40 | 34 | 28 | 27 | 17 | 14 | 8 | 12 | 18 | 17 | 21 | 274 |

*Year ending June 30, 1864.*

| Region. | 1863. | | | | | | 1864. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 66 | 90 | 87 | 59 | 51 | 39 | 28 | 18 | 18 | 27 | 52 | 95 | 616 |
| Central | 81 | 88 | 67 | 60 | 46 | 37 | 33 | 27 | 32 | 37 | 66 | 94 | 663 |
| Pacific | 29 | 27 | 25 | 20 | 15 | 10 | 10 | 8 | 11 | 11 | 11 | 14 | 184 |

*Year ending June 30, 1865.*

| Region. | 1864. | | | | | | 1865. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 117 | 110 | 80 | 63 | 59 | 41 | 36 | 26 | 28 | 38 | 57 | 66 | 682 |
| Central | 92 | 87 | 73 | 58 | 46 | 51 | 43 | 31 | 47 | 50 | 60 | 64 | 705 |
| Pacific | 23 | 31 | 32 | 29 | 18 | 10 | 13 | 10 | 10 | 9 | 16 | 24 | 225 |

*Year ending June 30, 1866.*

| Region. | 1865. | | | | | | 1866. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 54 | 44 | 37 | 33 | 27 | 21 | 16 | 14 | 17 | 19 | 28 | 48 | 446 |
| Central | 64 | 55 | 56 | 46 | 32 | 25 | 27 | 24 | 23 | 27 | 45 | 63 | 584 |
| Pacific | 25 | 27 | 27 | 29 | 18 | 22 | 14 | 9 | 11 | 16 | 26 | 22 | 246 |

The following tables give the monthly ratio of deaths per 1,000 of mean strength among the white troops in each region. In computing these tables the strength in general hospitals during each month has been added to the strength in the field and in garrison, because the deaths among both are represented by the reports.* The ratios, being small as compared with those which represent the cases, have been carried out to two decimal places; if the decimal point is disregarded, they may be read as whole numbers representing the ratio of deaths per hundred thousand of mean strength.

*Monthly mortality from diarrhœa and dysentery among white troops, expressed in ratio per* 1,000 *of mean strength.*

*Year ending June 30, 1862.*

| Region. | 1861. | | | | | | 1862. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 0.19 | 0.10 | 0.12 | 0.12 | 0.10 | 0.09 | 0.06 | 0.05 | 0.01 | 0.11 | 0.11 | 0.17 | 1.10 |
| Central | 0.13 | 0.58 | 0.53 | 0.71 | 0.73 | 0.76 | 0.52 | 0.53 | 0.76 | 0.67 | 1.05 | 1.25 | 9.56 |
| Pacific | 0.19 | 0.30 | 0.18 | 0.13 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.70 |

*Year ending June 30, 1863.*

| Region. | 1862. | | | | | | 1863. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 0.51 | 1.05 | 1.14 | 1.30 | 1.22 | 1.13 | 0.80 | 0.57 | 0.39 | 0.27 | 0.18 | 0.36 | 8.91 |
| Central | 1.70 | 1.90 | 1.97 | 2.01 | 1.77 | 1.49 | 1.64 | 2.12 | 2.49 | 1.93 | 1.85 | 2.00 | 23.00 |
| Pacific | 0.10 | ..... | ..... | 0.10 | 0.30 | ..... | 0.10 | 0.10 | ..... | ..... | 0.10 | ..... | 0.85 |

* The monthly strengths in hospitals used for this purpose will be found, for the Atlantic region, in Tables XI, XXXII, LV, and LXXXI; those for the Central region, in Tables XIX, XLII, LXVI, and XC, Part I, Vol. I. The remaining data are embraced in the tables enumerated in the note on page 18.

*Year ending June 30, 1864.*

| Region. | 1863. | | | | | | 1864. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 0.33 | 0.61 | 0.90 | 1.38 | 1.12 | 1.05 | 0.87 | 0.35 | 0.32 | 0.31 | 0.30 | 0.62 | 8.06 |
| Central | 2.85 | 3.49 | 2.90 | 2.32 | 2.25 | 1.57 | 1.34 | 0.78 | 0.67 | 0.63 | 0.92 | 1.61 | 20.80 |
| Pacific | 0.11 | 0.11 | ..... | 0.10 | ..... | ..... | 0.18 | 0.09 | ..... | 0.08 | ..... | ..... | 0.67 |

*Year ending June 30, 1865.*

| Region. | 1864. | | | | | | 1865. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 1.52 | 2.47 | 2.44 | 2.44 | 1.55 | 2.43 | 1.38 | 0.94 | 1.51 | 0.93 | 0.88 | 1.58 | 19.59 |
| Central | 3.00 | 2.97 | 3.10 | 2.92 | 1.78 | 1.60 | 1.53 | 1.34 | 1.23 | 1.26 | 1.10 | 0.98 | 23.38 |
| Pacific | 0.08 | 0.16 | 0.09 | 0.27 | ..... | 0.09 | 0.16 | ..... | 0.17 | ..... | 0.08 | ..... | 1.10 |

*Year ending June 30, 1866.*

| Region. | 1865. | | | | | | 1866. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 1.82 | 1.46 | 1.23 | 1.26 | 1.27 | 0.62 | 0.35 | 0.22 | 0.17 | ..... | ..... | 0.08 | 14.18 |
| Central | 2.05 | 1.89 | 2.41 | 2.21 | 1.69 | 1.21 | 0.77 | 0.41 | 0.32 | 0.29 | 0.53 | 0.34 | 20.25 |
| Pacific | ..... | 0.16 | 0.23 | 0.39 | 0.25 | 0.30 | 0.15 | 0.17 | 0.17 | 0.12 | ..... | 0.23 | 2.29 |

To facilitate the study of these ratios the diagrams facing page 22 have been constructed. The upper diagram represents the monthly ratio of cases, the lower one the monthly ratio of deaths, per 1,000 of strength. The death ratios being much smaller than the ratios for cases, the monthly fluctuations would not have been visible with sufficient distinctness had both diagrams been constructed on the same scale; in that which represents the deaths, therefore, the scale of the ordinates is fifty times greater than the scale used in that which represents the cases.

An examination of the upper diagram will show that in the Atlantic region the greatest monthly ratio of cases was in July, 1861, when it was 167 per 1,000 of mean strength, after which it progressively diminished until February, 1862, during which it was 22 per 1,000. The ratio then again increased, attaining its next maximum during July, 1862, when it was 128 per 1,000. This was the month following the disastrous

campaign of the army of the Potomac on the Peninsula. The ratio diminished to 88 in August, the army of the Potomac having been brought up to the neighborhood of Washington; it increased again in September, and attained 110 in October, the month following the battle of Antietam. After this it steadily diminished to 32 in April, 1863. The summer maximum in 1863 was attained in August, during which the ratio was 90; it was nearly as great during September, being 87; and then again diminished, falling gradually to 18 in February and March, 1864. The summer maximum of 1864 was attained in July, being 117; for August it was nearly as great, being 110. It then steadily diminished to 26 in February, 1865, and was again rising when the war came to an end and troops began to be mustered out. The summer maximum of 1865 occurred in June, and was only 66. The minimum reached in February, 1866, was 14; and the ratio had again risen to 48 in June, 1866, which is the last month represented in the tables.

In the Central region the greatest monthly ratio was 144 per 1,000 of strength, for August, 1861. The minimum during the winter of 1861–'62 was 55, reached in February. This was followed by a sudden increase to 111 in April, the month during which the greater portion of the Western armies lay at Pittsburg Landing. With their subsequent advance the number of new cases diminished to 67 in August; increased in September to 88; and fluctuated during the following winter, the ratios remaining higher than during any other winter in the Central region or any winter ratios in the other regions. The minimum during the winter was in December, 1862, and was 60 per 1,000. The fluctuations continued during the following spring and summer, rising at length to 88 in August, 1863; after which the rate steadily diminished to a minimum of 27 in February, 1864; and subsequently gradually increased to a maximum of 94 in the following June. It then diminished to a minimum of 34 in February, 1865; rose to its maximum during the summer of 1865 in June and July, being 64 for each month; fell off subsequently to 23 in March, 1866; and had again risen to 63 in June, when the table closes.

In the Pacific region the maxima were 38 for August, 1861; 40 for July and August, 1862; 29 for July, 1863; 32 for September, 1864; 29 for October, 1865; and 26 for May, 1866. The winter minima were 11 for January, 1862; 8 for February, 1863; 8 for February, 1864; 10 for December, 1864, and February and March, 1865; and 9 for February, 1866.

In the diagram representing the mortality attention is at once arrested by the very small mortality in the Pacific region throughout the whole period, and the comparatively small mortality in the other regions during the first year. It will be observed that subsequently, as a rule, the monthly mortality in the Atlantic and Central regions was greater during the latter part of the summer, fall, and early winter, than during the rest of the year. In the Atlantic region the ratio did not rise above one per 1,000 of strength until August, 1862. It continued above this figure during September, October, November, and December, the maximum being 1.30 per 1,000 in October. The ratio did not again reach one per 1,000 until October, 1863; the minimum during the intervening period being in May. It was 1.38 per 1,000 for October, and remained above one during November and December. After this it did not again attain one per 1,000 until July, 1864, the minimum meanwhile being again in May. During July the mortality was 1.52 per 1,000; in August it rose to 2.47; it continued at nearly this figure during September and October, fell off in November to 1.55, rose again in December to 2.43, and fell off in January, 1865,

*Diagram showing the monthly ratio of the cases of Diarrhoea and Dysentery among White troops.*

*Atlantic Region.* *Central Region* *Pacific Region.*

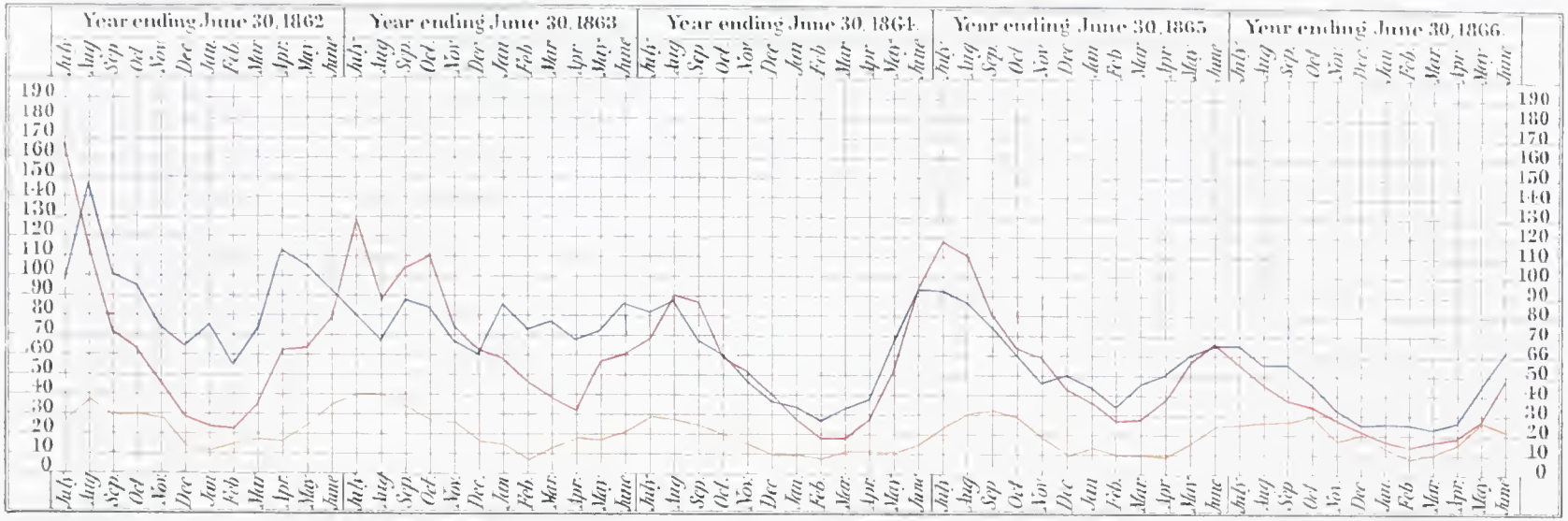
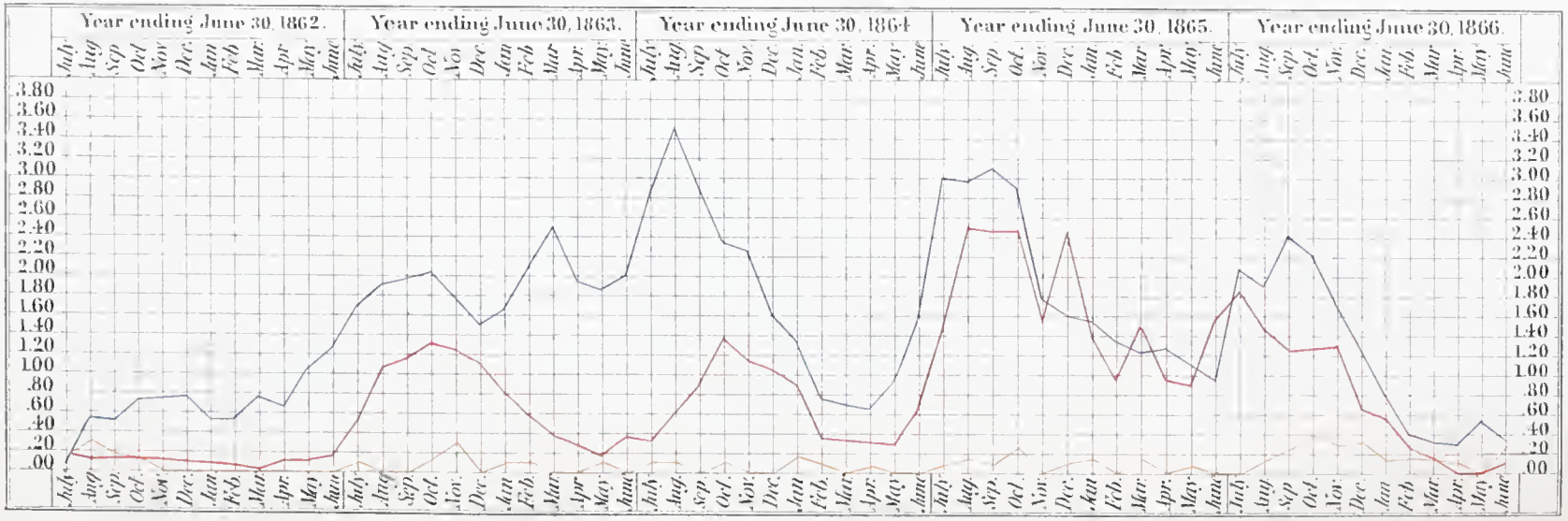

Year ending June 30, 1862.
Year ending June 30, 1863.
Year ending June 30, 1864.
Year ending June 30, 1865.
Year ending June 30, 1866.
July Aug Sep Oct Nov Dec Jan Feb Mar Apr May June
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0

*Diagram showing the monthly ratio of the deaths of Diarrhoea and Dysentery among White troops*

*Regions as indicated in the upper diagram. Scale fifty times greater.*


Year ending June 30, 1862.
Year ending June 30, 1863.
Year ending June 30, 1864.
Year ending June 30, 1865.
Year ending June 30, 1866.
July Aug Sep Oct Nov Dec Jan Feb Mar Apr May June
3.80 3.60 3.40 3.20 3.00 2.80 2.60 2.40 2.20 2.00 1.80 1.60 1.40 1.20 1.00 .80 .60 .40 .20 .00

to 1.38. After this it did not diminish during the spring in as marked a manner as during previous years, but fluctuated, always remaining comparatively high, the minimum, again in May, being .88. During all the period from June to November, 1865, it remained above one per 1,000, the maximum being in July. After November, 1865, the curve rapidly descends to nothing in April and May, 1866, increasing again slightly in June.

In the Central region the ratio first exceeded one per 1,000 in May, 1862, and afterward steadily increased to 2.01 per 1,000 in October. It then fell off to 1.49 for December, increased to 2.49 in March, 1863, fell off again to 1.85 for May, and then rapidly rose to 3.49 for August. After this it gradually diminished to 1.34 for January, 1864, and in February fell below one per 1,000 for the first time since May, 1862. It did not again exceed one per 1,000 till June, 1864, the minimum being in April. For June it was 1.61; during July, August, September, and October it was 3, or nearly 3, per 1,000; and then it slowly fell off, remaining, however, above one per 1,000 till June, 1865, when it was .98. For July, 1865, it was more than 2 per 1,000; in August, nearly 2; during September and October, more than 2; during November and December it again diminished; fell below one per 1,000 in January, 1866; and then steadily diminished to .29 in April, after which it again slightly increased.

In the case of the colored troops the monthly ratios, computed in the same manner as those for the white troops which have just been discussed, show a similar prevalence of diarrhœa and dysentery during the summer and fall, with a corresponding diminution during the winter months. The monthly ratio of mortality is, however, much greater. These ratios are presented in the following tables:*

*Number taken on sick report each month with diarrhœa and dysentery among colored troops, expressed in ratio per* 1,000 *of mean strength.*

*Year ending June 30, 1864.*

| Region. | 1863. | | | | | | 1864. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 95 | 219 | 186 | 101 | 68 | 39 | 28 | 25 | 39 | 40 | 95 | 110 | 836 |
| Central | 131 | 118 | 95 | 93 | 82 | 62 | 56 | 61 | 89 | 101 | 121 | 137 | 1,131 |

*Year ending June 30, 1865.*

| Region. | 1864. | | | | | | 1865. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 145 | 145 | 98 | 70 | 47 | 50 | 84 | 44 | 52 | 53 | 96 | 83 | 923 |
| Central | 106 | 108 | 89 | 63 | 57 | 55 | 50 | 42 | 56 | 61 | 83 | 93 | 865 |

*The data from which these ratios are constructed will be found in the following tables: Atlantic region, Tables CII, CV, CVIII; Central region, Tables CIII, CVI, and CIX, Part I, Vol. I. The mean strengths given in these tables, however, include the sick in hospital, which have been deducted in computing the above ratios for cases, (see Introduction to this volume.) There were no colored troops in the Pacific region.

*Year ending June 30, 1866.*

| Region. | 1865. | | | | | | 1866. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 64 | 46 | 33 | 22 | 24 | 13 | 23 | 22 | 23 | 27 | 18 | 24 | 421 |
| Central | 89 | 67 | 63 | 61 | 41 | 42 | 34 | 30 | 26 | 27 | 27 | 37 | 645 |

*Monthly mortality from diarrhœa and dysentery among colored troops, expressed in ratio per* 1,000 *of mean strength.*

*Year ending June 30, 1864.*

| Region. | 1863. | | | | | | 1864. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | ..... | 1.09 | 1.61 | 1.55 | 1.24 | 0.95 | 0.31 | ..... | 0.58 | 0.13 | 0.77 | 0.69 | 7.56 |
| Central | 8.78 | 12.36 | 9.48 | 9.87 | 5.59 | 3.36 | 2.83 | 2.32 | 2.69 | 3.53 | 4.69 | 6.28 | 59.73 |

*Year ending June 30, 1865.*

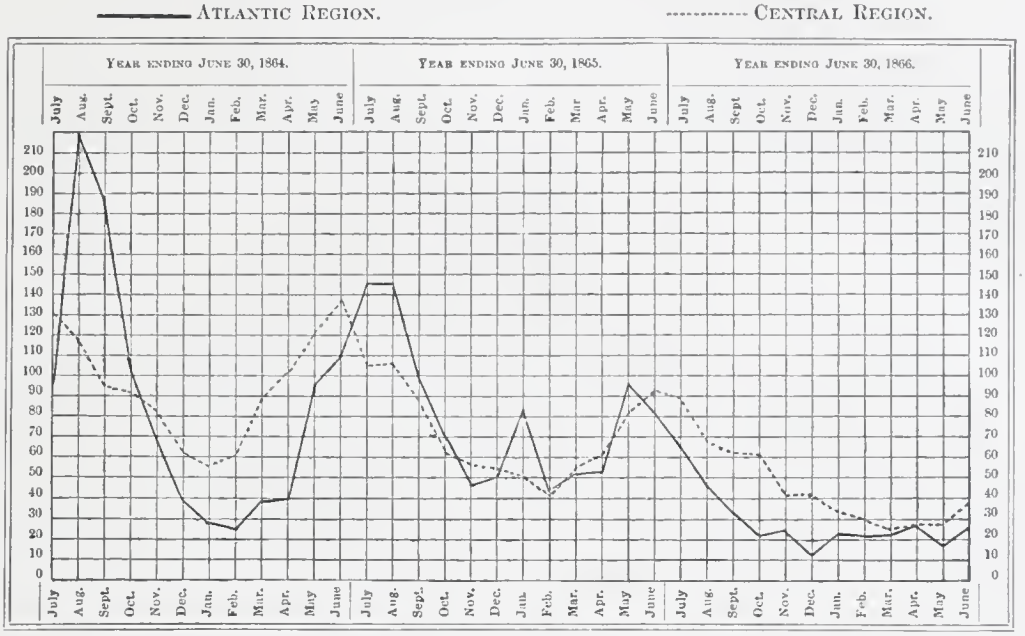
| Region. | 1864. | | | | | | 1865. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 1.87 | 2.12 | 3.58 | 3.30 | 2.64 | 2.53 | 2.10 | 3.06 | 2.23 | 1.44 | 3.22 | 3.63 | 31.23 |
| Central | 6.72 | 6.50 | 6.37 | 4.68 | 2.35 | 2.52 | 2.29 | 1.56 | 1.86 | 1.73 | 2.08 | 2.27 | 39.07 |

*Year ending June 30, 1866.*

| Region. | 1865. | | | | | | 1866. | | | | | | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | |
| Atlantic | 3.45 | 1.07 | 1.60 | 2.20 | 2.06 | 0.22 | 0.80 | 0.20 | 0.56 | 0.44 | ..... | 0.97 | 19.49 |
| Central | 3.30 | 3.56 | 3.33 | 3.10 | 2.66 | 1.72 | 1.26 | 1.08 | 0.84 | 0.66 | 0.52 | 0.28 | 28.56 |

The ratios embraced in the foregoing tables are graphically represented in the accompanying diagrams, which have been constructed on precisely the same scale as those representing the cases and deaths among the white troops, the ordinates in the mortality diagram being on a scale fifty times greater than the scale used for the cases. The reasons for adopting a greater scale for the mortality (page 21) do not apply with so much force to the case of the colored troops, but it appeared desirable that the same scales should be used as for the whites.

*Diagram showing the monthly ratio of the cases of diarrhœa and dysentery among colored troops.*




An examination of the diagram which represents the monthly ratio of cases shows that in the Atlantic region the greatest monthly ratio occurred in August, 1863, when it was 219 per 1,000 of strength. The ratio then diminished monthly to 25 per 1,000 in February, 1864, and subsequently increased in a fluctuating manner to 145 in July and August. It then again diminished during September and October, after which, with the exception of a temporary increase in January, 1865, it remained in the vicinity of 50 per 1,000 from November to April, 1865. In May it rose to 96 per 1,000, subsequently again diminishing gradually to a minimum of 13 per 1,000 in December, after which it again somewhat increased.

In the Central region the ratio was 131 per 1,000 in July, 1863, diminishing gradually to 56 in January, 1864, and again steadily increased to 137 in June, 1864; it then diminished steadily to 42 in February, 1865; rose to 93 the following June; fell gradually to 26 in March, 1866; continued at 27 during April and May, and rose to 37 in June.

The diagram opposite page 26 represents the mortality. It shows that in the Atlantic region the mortality rapidly rose from nothing in July, 1863, to 1.61 per 1,000 in September; after which it again diminished to nothing in February, 1864. It then rose in a fluctuating manner to an autumnal maximum of 3.58 for September and 3.30 for October, and again fell off, but with fluctuations, to 1.44 in April, 1865. This was followed

by a sudden rise to 3.22 in May, 3.63 in June, and 3.45 in July, followed by a sudden fall to 1.07 in August. Then came an autumnal rise to 2.20 in October, maintained at 2.06 for November. In December the ratio suddenly fell to .22 per 1,000, after which it fluctuated, always, however, remaining less than one per 1,000 till May, 1866, during which no deaths occurred. During June the ratio again increased to nearly one per 1,000.

In the Central region the mortality was conspicuously greater than in the Atlantic during the first year and a half. During August, 1863, the ratio reached 12.36 per 1,000. After this it diminished monthly to 2.32 in February, 1864, and then rose again to 6.28 in June, and remained above 6 during July, August, and September. After this it fell fluctuatingly to 1.73 in April, 1865, and then rose again to 3.30 in July. It remained above three per 1,000 during August, September, and October, after which it steadily diminished till the close of the period represented by the tables.

The ratios presented above appear to establish beyond all question the great influence of season on the prevalence of diarrhœa and dysentery. Cases occurred at all times of the year, indicating that season was only one of the causes at work; but the summer and autumn always brought with them a great increase in the number of cases, followed, as might be expected, by an increase of the mortality.

Diarrhœa and Dysentery in the Confederate Armies.—It is greatly to be regretted that it is not possible to ascertain with any accuracy the extent to which diarrhœa and dysentery prevailed in the Confederate armies, and the mortality which resulted. Whatever statistical or other reports may have been collected at the office of the Confederate Surgeon General were destroyed at the time of the fall of Richmond, along with other archives of the Confederate War Department, and the fragmentary information which it has been possible to collect from various sources is of the most unsatisfactory character.

In July, 1863, Dr. T. H. Williams, formerly a surgeon in the Confederate army, furnished to the Surgeon General's Office copies of his consolidated monthly reports of sick and wounded for the Confederate army of the Potomac from July, 1861, to March, 1862, during which time he was its medical director. These consolidated reports are imperfect in the matter of mortality, the total number of deaths being given in the general summary, but not the number of deaths from each disease. The deaths in general hospital are not included. No notion of the mortality from diarrhœa and dysentery can therefore be obtained from these reports. They give, however, the monthly number of cases, and although they do not embrace reports from all the regiments present, represent so considerable a strength that it is probable the ratios deduced give a just idea of the prevalence of the disorders in question in the army to which they refer.

A comparison of these reports with those of the Federal army of the Potomac for the same period shows that the ratio of cases to strength was considerably less in the latter army. The Confederate reports represent an average mean strength of 49,394. During the nine months 36,572 cases of diarrhœa and dysentery are reported, being 740 per 1,000 of mean strength. The reports of the Federal army of the Potomac for the same period represent an average mean strength of 111,168; the number of cases reported is 45,214, being 407 per 1,000 of mean strength for the nine months, or not much more than half the proportion of cases which occurred in the Confederate army.

The following table gives the mean strength represented by the reports, the number of cases, and ratio of cases to strength for each month:

*Number of cases of diarrhœa and dysentery in the Confederate and Federal Armies of the Potomac from July* 1, 1861, *to March* 31, 1862, *with the ratio per* 1,000 *of mean strength for each month.*

| Month. | Confederate Army of the Potomac. | | | Federal Army of the Potomac. | | |
|---|---|---|---|---|---|---|
| | Mean strength represented by the reports. | Number of cases. | Ratio per 1,000 of mean strength. | Mean strength represented by the reports. | Number of cases. | Ratio per 1,000 of mean strength. |
| July, 1861 | 21,577 | 3,123 | 145 | 17,709 | 3,450 | 195 |
| August, 1861 | 50,525 | 6,965 | 138 | 50,608 | 6,186 | 122 |
| September, 1861 | 58,360 | 3,432 | 59 | 85,408 | 5,818 | 68 |
| October, 1861 | 58,918 | 3,821 | 65 | 113,201 | 7,131 | 63 |
| November, 1861 | 55,099 | 3,388 | 61 | 133,669 | 6,314 | 47 |
| December, 1861 | 56,700 | 3,952 | 70 | 152,759 | 4,447 | 29 |
| January, 1862 | 57,089 | 4,467 | 78 | 167,267 | 3,910 | 23 |
| February, 1862 | 54,810 | 4,528 | 83 | 153,308 | 3,151 | 21 |
| March, 1862 | 31,470 | 2,896 | 92 | 126,588 | 4,574 | 36 |

A comparison of the ratios for the two armies shows that in both the proportion taken sick was greatest during July and August, 1861, and that the ratio diminished during the winter, again increasing in March, 1862. But the winter ratios of the Confederate are much larger than those of the Federal army. During July and September the Confederate ratios are less than the Federal, but these months are the only exceptions.

Of 36,572 cases embraced in the reports of Dr. Williams, 25,971 are acute diarrhœa and 8,286 acute dysentery, making 34,257 acute cases. There are 1,874 cases reported as chronic diarrhœa and 441 as chronic dysentery, making 2,315 chronic cases, the proportion being one chronic case to fifteen acute. In the Federal army of the Potomac for the same period the proportion was one chronic case to eighteen acute.* From the greater proportion of chronic cases we may infer that the ratio of mortality was greater in the Confederate than in the Federal army at the time under consideration, although we have no means of determining precisely what the ratio was.

Dr. Williams has also furnished to the Surgeon General's Office consolidated monthly reports of sick and wounded for certain general hospitals in Virginia under his charge during the months of September, October, November, and December, 1862. The reports embrace the hospitals at Petersburg, Danville, Lynchburg, Farmville, Charlottesville, Staunton, Gordonsville, Culpepper Court-House, and Warrenton. In these, as in his reports for the army of the Potomac, the total number of deaths each month is given in a general summary, but they are not distributed among the several diseases, so that it is impossible to ascertain from them the mortality from diarrhœa and dysentery. The number admitted was as follows:

| | | | |
|---|---|---|---|
| Acute diarrhœa | 2,474 | Chronic diarrhœa | 2,113 |
| Acute dysentery | 381 | Chronic dysentery | 145 |
| Total acute | 2,855 | Total chronic | 2,258 |

* See Table VI, Part I, Vol. I.

The total number of sick admitted during the same period was 34,890, the proportion of diarrhœal diseases being rather more than one in seven.

Among the Confederate archives which fell into the hands of the United States authorities after the close of the war, is a full series of registers of the Chimborazo hospital, Richmond, Virginia, extending from October 17, 1861, to March, 31, 1865. As this hospital was situated immediately at the base of operations of one of the chief armies of the Confederacy, and received during the war nearly seventy-eight thousand sick and wounded soldiers, it was hoped that its records would prove extremely valuable. It is true that separate registers were kept in the different wards, and as patients were continually transferred from ward to ward the labor of preparing a correct statistical statement from them was very great. This difficulty, however, was overcome by tracing the transfers of each individual soldier before commencing to compile the statistics of the hospital, and hence does not interfere with the accuracy of the result. More unfortunate is the circumstance that the names of nearly nine thousand soldiers are recorded as admitted, without any record of what became of them. It appears from the registers that altogether 77,889 soldiers were admitted to this hospital, of whom 63,357 were sick, and 14,532 wounded. Of the sick, 3,146 died, 18,049 were transferred to other hospitals, and there is no record of what became of 7,348. Of the wounded, 798 died, 3,809 were transferred to other hospitals, and there is no record of what became of 1,534. Besides these omissions, due to negligence on the part of those who kept the registers, there is an unavoidable difficulty arising from an administrative reason. A very large number of the patients were sent home on furlough, who do not appear to have returned to this hospital, and whose fate cannot be ascertained. The whole number thus furloughed was 13,080, of whom 8,052 were sick, and 5,028 wounded. Many of these men merely went home to die.

The number of admissions for diarrhœa and dysentery recorded is 10,503, or one out of every 6 of the sick. Of these, 2,856 were transferred to other hospitals, 1,570 furloughed, and there is no record of what became of 1,408. Omitting these, 4,669 cases remain, the results of which are recorded. Out of these, 455 died, or one out of every 10, and 77 were discharged for disability, or one out of every 61.

The mortality as thus computed is nearly a third less than that of the Lincoln hospital at Washington, and almost one-half that of the Hampton hospital at Fortress Monroe.*

Some valuable, though fragmentary, information with regard to the health of the Confederate armies has been collected and published by Dr. Joseph Jones, formerly a surgeon in the Confederate service.† This gentleman had access at various times during the war to the records of the Confederate Surgeon General and other official sources of information, and appears to have used his opportunities, such as they were, with considerable diligence. According to Dr. Jones, the reports of sick and wounded for the

* The figures obtained by analyzing the registers of the Chimborazo hospital differ very much from those which have been published by Dr. Joseph Jones, (Richmond and Louisville Medical Journal, June, 1870, page 650,) not merely because Dr. Jones only includes a part of the time—(he does not state the precise limits, but gives the "Total number admitted, 47,176; deaths, 3,031,") but also because he computes his ratios of mortality upon the whole number of admissions, without regarding the transfers to other hospitals.

† "Observations upon the losses of the Confederate armies from battle, wounds, and disease, during the American Civil War of 1861–'65," &c., &c., by Joseph Jones, M. D., in the Richmond and Louisville Medical Journal, October, 1869, p. 339; November, 1869, p. 451; March, 1870, p. 257; and June, 1870, p. 635. See also his essay "On the prevalence and fatality of pneumonia and of typhoid fever in the Confederate army during the war of 1861–'65," and his "Investigations upon the diseases of the Federal prisoners confined in Camp Sumter, Andersonville, Georgia," which together constitute about one-third of the medical volume of the "Sanitary Memoirs of the War of the Rebellion, collected and published by the United States Sanitary Commission," New York, 1867. Dr. Jones has also announced a volume of "Medical and Surgical Memoirs" in preparation, (see Richmond and Louisville Medical Journal, May, 1871, p. 616,) which we are informed will contain an account of his observations in the Confederate army; but this has not yet been published. [Note. Vol. I of this work has appeared since the foregoing was printed, New Orleans, 1876.—Ed.]

years 1861 and 1862, filed in the office of the Confederate Surgeon General, exclusive of those from the trans-Mississippi department, give the following figures for diarrhœa and dysentery:* "Field reports, 226,828 cases, and 1,696 deaths; hospitals, 86,506 cases, and 1,658 deaths." Dr. Jones points out† that the number of hospital admissions is so much greater than the number shown by the field reports to have been sent to hospital that the figures can be accounted for only by "the repeated transfers of patients during convalescence from one hospital to another." The relations of the hospital admissions to the number of cases on the field reports in the Confederate service were, in fact, identical with what has already been described‡ in the case of the field and hospital reports of the United States army, and in appreciating the figures of Dr. Jones we must, therefore, compare the number of cases on the field reports with the total number of deaths in the field and in hospital. This will give 3,354 deaths out of 226,828 cases, or one death to every 67.6 cases. The total number taken on sick report in the field during the same period, not counting the wounded, was 818,986; and the total number of deaths from disease reported in the field and in hospital was 31,338, or one death to 26 cases for all diseases. Hence the cases of diarrhœa and dysentery were to the whole number of cases as one to 3.6, the deaths to the whole number of deaths as one to 9.3.

Dr. Jones himself points out§ that the returns upon which the above statement is based are incomplete, and that the results are to be regarded as merely an approximate estimate; nevertheless, in the absence of more accurate information, they must be regarded as valuable.

If the ratios just given are contrasted with similar ones computed from the returns of the United States armies for the same period, it will be seen that the ratio of deaths to cases of all diseases is about half that reported by Dr. Jones for the Confederate armies; and hence that the ratio of death from diarrhœa and dysentery to all deaths from disease is very much smaller for the Confederate than it is for the United States armies. On the other hand, the ratio of the cases of diarrhœa and dysentery to the total number of cases of disease is about the same in both armies.

The consolidated tables for the United States armies from the commencement of the war to December 31, 1862,‖ give the total number taken on sick report for disease as 1,661,602, of which 482,764 were cases of diarrhœa and dysentery. The total number of deaths from disease reported in the field and in hospital was 33,090, of which 6,040 were deaths from diarrhœa and dysentery. These figures represent one death to every 50 cases for all diseases, and one death out of every 79.9 cases of diarrhœa and dysentery. The cases of diarrhœa and dysentery were to the whole number of cases as one to 3.4; the deaths to the whole number of deaths from disease as one to 5.5.

If from the whole number of cases and of deaths from disease the cases and deaths of diarrhœa and dysentery are deducted, it will be found that the ratio for all other diseases was one death to every 21 cases in the Confederate armies, one death to every 44 cases in the United States armies. It will be seen, therefore, that the small ratio of the deaths from diarrhœa and dysentery to all the deaths from disease in the Confederate armies resulted from the greater proportionate mortality of other diseases, and not from a smaller proportion of mortality from diarrhœa and dysentery.

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* Richmond and Louisville Medical and Surgical Journal, October, 1869, p. 346.
† Loc. cit., p. 347.
‡ Introduction to Vol. I, Part I.
§ Loc. cit., p. 348.
‖ Vol. I, Part I, Tables III, XXIV, and XLVII.

It is greatly to be regretted that Dr. Jones, in presenting the results of his tabulation of the fragmentary Confederate returns for 1861–'62, does not state the mean strength represented by the reports. This would have greatly enhanced the value of his figures; as it is, no estimate of the ratio of cases or deaths to strength can be made for comparison with the ratios for the United States armies during the same period.

The papers of Dr. Jones, in the Richmond and Louisville Medical Journal, also contain several statistical tables drawn up from the reports and records of various Confederate general hospitals, which furnish fragmentary information on the subject of diarrhœa and dysentery. Thus the "tabular statement of the diseases treated in the general hospital of Charlottesville, Virginia,"* from July, 1861, to February, 1865, contains 2,172 admissions from diarrhœa and dysentery, and 81 deaths. The tabular statement for "the general hospitals in the army of the Potomac and Northern Virginia,"† from January, 1862, to March, 1863, contains 14,480 cases of diarrhœa and dysentery, and 587 deaths. The tabular statement for "the general hospitals in and around Richmond, Virginia,"‡ from September, 1862, to March, 1863, contains 8,737 cases of diarrhœa and dysentery, but the deaths are only reported for January, February, and March, 1863, during which period there were 1,603 cases and 74 deaths. The tabular statement for "the general hospitals in Virginia, including those in and around Richmond, Virginia,"§ for April, May, June, and July, 1863, contains 13,758 cases of diarrhœa and dysentery, but the number of deaths is not stated.

The value of all these statistical tables is greatly impaired by the fact that the number of cases of each disease transferred from hospital to hospital is not reported, and as there is no way of ascertaining the extent to which cases were duplicated in this way, the proportion of deaths to cases has not much significance.

In the report of his investigations upon the diseases of the Federal prisoners at Andersonville, Dr. Jones has given a very complete statement of the sickness and mortality among the Confederate troops detailed as the guard at that place during the months of July and August, 1864.‖ During the month of July there were 172 cases and 6 deaths of diarrhœa and dysentery out of a mean strength of 3,881 officers and men; during August, 351 cases and 9 deaths of diarrhœa and dysentery out of a mean strength of 3,629 officers and men. Dr. Jones gives separately the reports of the several regiments comprising the guard, and of the post hospital in which the more serious cases of disease occurring among them were treated.¶ In condensing the above statement from his tables the cases given represent only those on the regimental returns, but the deaths in the post hospital are included. The figures correspond to a ratio of 44 cases and 1.54 deaths per 1,000 of mean strength during the month of July, and 97 cases and 2.48 deaths per 1,000 of mean strength during the month of August.

The ratio of cases for both July and August are considerably less than the ratios given on page 19 for the white troops of the United States armies in the Atlantic region during the same months of 1864. The mortality rates of the white troops of the United States armies in the Atlantic region, from diarrhœa and dysentery during the same months,

* The Richmond and Louisville Medical Journal, March, 1870, p. 272.

† The same, June, 1870, p. 652. ‡ Loc. cit., p. 653. § Loc. cit., p. 654.

‖ Sanitary Memoirs of the War of the Rebellion, collected and published by the United States Sanitary Commission. Medical Volume, New York, 1867, p. 553.

¶ But adds the 61 cases sent to the post hospital to the number on the regimental reports, which already included them, or should have done so, making thus 584 cases instead of 523. Op. cit., p. 563.

given on page 21, are very nearly the same as those of the Andersonville guard, being 1.52 per 1,000 of strength for July, and 2.47 for August.

Upon the whole it must be conceded that the data above presented are not sufficiently complete to warrant the expression of an opinion as to whether the mortality from diarrhœa and dysentery in the Confederate armies throughout the war was greater or less than it has been shown to have been in the armies of the United States.

Dr. Jones has expressed the opinion, derived from his own extensive observations, that these diseases destroyed and disabled more soldiers in the Confederate armies than gunshot wounds. He says: "Chronic diarrhœa and dysentery were the most abundant and most difficult to cure amongst army diseases; and whilst the more fatal diseases, as typhoid fever, progressively diminished, chronic diarrhœa and dysentery progressively increased, and not only destroyed more soldiers than gunshot wounds, but more soldiers were permanently disabled and lost to the service from these diseases than from the disability following the accidents of battle."*

If the latter part of this paragraph does not, in the absence of exact statistical data, considerably exaggerate the mortality and disability produced by these diseases, it must be admitted either that they were much more fatal in proportion to mean strength, or that gunshot wounds were much less so, than in the armies of the United States. In view of the paucity of statistics, however, it would hardly be wise to regard the opinion of Dr. Jones as representing more than the general impression made upon his mind by the extreme prevalence and great fatality of the disorders in question.

Diarrhœa and Dysentery among the Prisoners of War held by the Confederates.—Before concluding these preliminary statistical remarks the subject of the prevalence of diarrhœa and dysentery among the prisoners of war on both sides requires consideration. It might be anticipated that the influences prevailing in the barracks and camps in which prisoners of war were confined would prove even more unfavorable than those of the camps and barracks of the active forces, and that intestinal fluxes would be both more common and more fatal, even if reasonable care should be taken to provide proper shelter and to furnish abundant supplies of suitable nutritious food. If these indispensable humanities were unavoidably or wilfully neglected, the result could readily have been foreseen.

Full statistical reports of what actually occurred on either side do not exist, but the records of sickness and mortality among the Confederate prisoners in the hands of the United States authorities are comparatively complete, while those referring to the Federal prisoners in the hands of the Confederates are exceedingly fragmentary. In the first instance, it has been possible to prepare an alphabetical register of deaths, embracing very nearly all which occurred, and which assigns the cause as reported by the attending surgeon in the great majority of instances. Monthly reports of sick and wounded from the larger prison depots are also on file, and separate reports of the prisoners of war treated in a number of the general hospitals. Altogether the reports must be considered quite as complete as those which represent the sickness and mortality of our own armies. In the case of the United States prisoners held by the Confederates, on the other hand, little statistical information can be obtained for any of the large depots except Andersonville and Danville, beyond the number of graves found after the close of the war. The general

* Op. cit., p. 638.

subject of sickness and mortality among prisoners of war, and the causes by which they were determined, must be reserved for a future chapter; in this place attention is directed only to the comparative prevalence and mortality of diarrhœa and dysentery. So far as can be ascertained, the mortality from these diseases among the prisoners held by the Confederates amounted to more than one-half of all the deaths from disease.

The original hospital register of the famous prison at Andersonville has fortunately been preserved, and is now deposited in the office of the Adjutant General. This book records 17,875 admissions of prisoners to hospital between February 24, 1864, and April 17, 1865. Out of this number 12,541 deaths are recorded. The causes of 1,292 deaths are not given; 163 died of wounds, and 11,086 of disease. There were 7,352 cases and 5,605 deaths of diarrhœa and dysentery recorded, the deaths amounting to a little over 76 per cent. of the cases, and to more than one-half of all the deaths from disease. A large number of the cases and deaths are entered on the register simply as diarrhœa or dysentery, without specifying whether the disease was acute or chronic, as shown in the following synopsis:

*Cases and deaths from diarrhœa and dysentery recorded in the Andersonville Prison hospital register from February 24, 1864, to April 17, 1865.*

| | Admissions. | Deaths. |
|---|---|---|
| Acute Diarrhœa | 1,286 | 956 |
| Chronic Diarrhœa | 1,331 | 831 |
| Diarrhœa | 2,812 | 2,224 |
| Acute Dysentery | 633 | 560 |
| Chronic Dysentery | 228 | 212 |
| Dysentery | 1,062 | 822 |
| Total | 7,352 | 5,605 |

Among the more fatal other diseases there are recorded 5,662 cases and 3,614 deaths from scurvy; 333 cases and 192 deaths from debility; 453 cases and 351 deaths from anasarca; 538 cases and 404 deaths from typhoid and malarial fevers; 99 cases and 60 deaths from gangrene; and 276 cases and 218 deaths from pneumonia. It will be observed that the deaths ascribed on the register to diarrhœa, dysentery, and scurvy constitute very nearly three-fourths of the deaths from all causes.

The above statement is derived from a careful count of each name entered on the hospital register. The register itself is well kept, in one very large folio volume of a characteristic blue-ruled yellow-tinted paper, extensively used in the Confederate States during the war. The writing is legible, and the manner in which the book is kept is every way creditable to the surgeons in charge of the hospital. It is not probable that it contains all the deaths which occurred, for there are 1,001 admissions recorded opposite which there is no entry to show what became of the patients. Moreover, it appears from a report of the Quartermaster General* that the graves of 13,705 Federal prisoners, 13,008

* See the "Report on the Treatment of Prisoners of War by the Rebel Authorities during the War of the Rebellion," by the committee of the House of Representatives, of which the Hon. John P. Shanks, of Indiana, was chairman.—Report No. 45, House of Representatives, 3d Session, 40th Congress. Government Printing Office, Washington, 1869, page 776.

of which it was possible to identify, were found at Andersonville after the close of the war. The discrepancy is no doubt partly due to the omissions to record the disposition of so large a number as 1,001 admissions, and perhaps, also, occasionally deaths occurred in the stockade which were not duly taken up on the hospital register, though as a rule it would appear that such deaths were taken up and recorded. On the whole, the medical authorities seem to have taken unusual pains to record faithfully the admissions and deaths as they actually occurred, and preference is, therefore, here given to this register over all other sources of information with regard to the sickness and mortality at this depot.*

Dr. Joseph Jones, in his elaborate report on the sanitary condition of the prisoners at this depot, presents in tabular form† a monthly statement of the number of cases and deaths among the Federal prisoners at Andersonville for six months, from March to August, 1864, inclusive. These tables, which possess a certain degree of value, were drawn up from the monthly reports of sick and wounded on file in the office of the surgeon of the post when it was visited by Dr. Jones in September, 1864.

During this period the mean number of prisoners present was as follows: March, 7,500; April, 10,000; May, 15,000; June, 22,291; July, 29,030; August, 32,899; the average strength for the whole period being 19,453. "During the six months, 12,090 cases and 3,530 deaths from acute and chronic diarrhœa, and 4,682 cases and 999 deaths from acute and chronic dysentery, were recorded. The cases of diarrhœa and dysentery together numbered 16,772, or nearly one-half of the total number of sick and wounded. The deaths caused by these two diseases are recorded at 4,529, or, in other words, these diseases caused more than one-half, or more exactly 58.7 per cent., of all the deaths. These figures are below the truth. As far as my personal examinations extended, almost every prisoner was affected with either diarrhœa or dysentery."‡

These figures represent an annual mortality from diarrhœa and dysentery alone of 466 per 1,000 of mean strength. The total mortality among the prisoners during the same period, as given in the tables of Dr. Jones, was 7,712; of these 27 were violent deaths, and 7,685 deaths from disease. This is at the rate of 790 deaths from disease per 1,000 of mean strength annually. The monthly sick reports used by Dr. Jones were evidently not drawn up merely from the hospital register mentioned above, for his tables contain 42,686 cases, while the number of admissions on the register during the same period was only 10,453. There is, however, but a trifling difference between the total number of deaths as given in the tables of Dr. Jones and the number recorded on the hospital register for the same period. It would hence appear probable that the sick reports contained non-fatal cases treated in the stockade as well as the fatal cases and those sent to hospital, while the non-fatal cases treated in the stockade are apparently not entered in the hospital register.

This circumstance would give very great value to the tables of Dr. Jones if they could be regarded as strictly accurate. There is reason to believe, however, that the clerks who prepared the reports occasionally modified the facts to make them conform to the printed

* A list of the deaths of Federal prisoners at Andersonville, purporting to extend from February 27, 1864, to February 2, 1865, was secretly copied by Private Dorence Atwater, Co. D, Second New York Cavalry, a prisoner employed as a clerk in the prisoners' hospital, and was purchased from him by the Adjutant General. This list, which is quoted in the Report of the Congressional Committee on the Treatment of Prisoners of War, contained 12,631 deaths, being 99 more than the number given above, although the time represented is a month and a half less: in view of the excellent character of the original hospital register, it has not been thought desirable to do more than mention it in this place.

† Sanitary Memoirs, &c., collected and published by the United States Sanitary Commission. Medical Volume, New York, 1867, page 524.

‡ Op. cit., page 627.

blank employed. Thus the tables neatly distribute the deaths from diarrhœa and dysentery as follows:

| | |
|---|---|
| Acute Diarrhœa | 2,161 |
| Chronic Diarrhœa | 1,369 |
| Acute Dysentery | 848 |
| Chronic Dysentery | 151 |
| Total | 4,529 |

Whereas on the hospital register during the same period there are 1,381 deaths simply ascribed to diarrhœa, and 612 to dysentery, without specifying whether the disease was acute or chronic. Various other discrepancies are also to be observed between the number of deaths from particular diseases as counted on the hospital register and that given in the tables, which can therefore only be regarded as approximative.

There is no reason to believe that Dr. Jones had the slightest intention to misrepresent the facts. On the contrary, he appears to have been actuated by the most sincere desire to present the whole truth with the utmost fidelity. It was of course not in his power during his short visit to verify the sick reports by an actual count of the registers, and he probably did not suspect their accuracy. Moreover, the errors are not such as would have been intentionally made, and while the number of deaths from some diseases, as given by the sick reports, is smaller than the number on the hospital register, that from other diseases is larger, and the total mortality closely approximates the truth.

This is not the place for the full discussion of the causes which produced the fearful mortality among the Andersonville prisoners. The subject has been elaborately treated by Dr. Jones, and by a committee of the House of Representatives.* To these treatises the reader is referred for details, a simple outline of the leading facts being all that is here required.

Camp Sumter, as the depot was designated by the Confederate authorities, was situated about half a mile from Andersonville station, on the Southwestern railroad leading from Macon to Americus, Georgia. Originally about seventeen acres of ground were inclosed by a stockade of pine logs twenty feet high. The first prisoners arrived in February, 1864; by April there were 10,000. In July, the number of prisoners being above 29,000, and more being expected, the stockade was enlarged to an area of twenty-three acres and a half.† Through this inclosure flowed a sluggish stream of water about six feet in width, bordered on each side by a low swamp which occupied six acres of the narrow territory allotted to the prisoners. Into this stream and swamp the drainage of the camp took place, and the stream was at the same time the chief source of water supply. No shelter was provided by the Confederate authorities except for the hospital, but some of the prisoners contrived to build huts of pine boughs roofed with pieces of shelter tents, while others burrowed in the ground. There is conclusive testimony that the rations furnished were of poor quality and insufficient in quantity. Unbolted corn meal was chiefly used instead of flour, and the fragments of husk which it contained seemed to aggravate the tendency to diarrhœa and dysentery. A scorbutic condition of the system was consequently almost universal. The hospital accommodations were most meagre and inadequate.

* Report cited on page 32—note.

† According to Dr. Jones to twenty seven acres. Page 501 of the Memoirs cited on page 33—note

At first a corner of the stockade was set aside for the purpose. In the latter part of May the hospital was removed to a point outside of the southwest angle of the prison inclosure. Here, in a space of about five acres, nearly two thousand sick were scantily sheltered by old and ragged tents. The number of bunks was insufficient, and many of the patients lay on the ground without even a blanket. The mortality which prevailed was the inevitable result of over-crowding, exposure, and starvation.

The condition of the Federal prisoners at Salisbury, North Carolina, appears to have been quite as bad as at Andersonville, if not worse; but no such careful records as were kept by the medical officer at Andersonville have been discovered, if indeed they ever existed. According to the report of the Quartermaster General the graves of 12,112 Union prisoners were found there after the close of the war; of these only 78 were so marked as to be identified.* At this place a brick factory, with the buildings used as boarding houses for the operatives, was originally used to shelter the prisoners, and about five acres of ground around them was inclosed by a high board fence. In the fall of 1864, 10,000 prisoners were sent there, and the buildings being quite insufficient the greater portion of them were without shelter. Exact accounts of the number of prisoners confined here, and of the diseases which produced the mortality, cannot be obtained, but it is stated by Assistant Adjutant General T. W. Hall, in a report to the Confederate Adjutant General, February, 1865,† that pneumonia and diseases of the bowels were the prevailing diseases.

Another large depot was at Danville, Virginia. Here some old tobacco warehouses served to shelter a portion of the prisoners. An exact account of the number confined cannot be obtained, but the greater portion of the seriously sick appear to have been treated in Division No. 2 of the Danville hospital. The register of this hospital has been secured, and is preserved in the office of the Adjutant General of the Army. It extends from November 23, 1863, to March 27, 1865. During this period 4,332 admissions were recorded, of whom 262 were transferred to other hospitals, and 1,084 died. The Quartermaster General reports that after the close of the war 1,323 graves of Union prisoners were found at this place, all of which it was possible to identify,‡ so that the records of Hospital No. 2 contain rather more than four-fifths of all the deaths. The number is so large as to be valuable for comparison with the Andersonville records. Of the 1,084 deaths recorded, 1,074 were from disease. The number of deaths from diarrhœa and dysentery was 592, being more than half of all the deaths from disease. These are distributed as follows: Diarrhœa 18, acute diarrhœa 50, chronic diarrhœa 507, dysentery 2, acute dysentery 6, chronic dysentery 5, colitis 4. During the same period the total number of admissions for diarrhœa and dysentery was 1,433, of whom 39 were transferred to other hospitals; omitting these, there was one death out of every 2.4 admissions. These figures represent a condition of things not unlike Andersonville, though on a smaller scale.

There is also preserved in the office of the Adjutant General of the Army a list of the deaths of Union prisoners in the prison at Cahawba, Alabama, copied from the original records kept by the medical officer in charge, Surgeon L. E. Profilet, of the Confederate army. This list contains 142 deaths, of which 135 were from disease; of these, 42 were from diarrhœa and 3 from dysentery. The register extends from December 28, 1863, to April 28, 1865. The actual number of prisoners present during this period is unknown. According to the report of Assistant Adjutant General D. T. Chandler,§ there were 2,151

* Page 776 of the Report cited on page 32—note.
† Page 179 of the same Report.
‡ Page 776 of the same Report.
§ Page 200 of the same Report.

prisoners there October 16, 1864, but how long anything like this number were present does not appear. The number of graves reported by the Quartermaster General as having been found at this place after the war was 147, all identified;* of these, 5 were citizens and 142 enlisted men, so that the list of Surgeon Profilet appears to be complete.

The Andersonville and Danville prisons are the only ones in which large numbers of Federal prisoners were confined for which it is at present possible to obtain even approximate statistical information with regard to the distribution of the deaths among particular diseases. The Quartermaster General reports† that, after the close of the war, 3,450 graves of prisoners were found at Richmond, Virginia, including the victims of the Libby, Smith, Pemberton, Castle Thunder, and Belle Isle prisons. At Florence, South Carolina, 2,795 were found; at Millen, Georgia, 748; and smaller numbers at other places. Such hospital records as may have been kept at these places have either been destroyed or concealed.

Diarrhœa and Dysentery among the Prisoners of War held by the United States.—In the case of the Confederate prisoners in the custody of the United States authorities, diarrhœa and dysentery were far less fatal than among the Federal prisoners in the hands of the Confederates. The ratio of mortality was, nevertheless, large.

The alphabetical registers of the Surgeon General's Office record the deaths of 30,716 Confederate prisoners of war. This list embraces not merely the deaths in the great prison depots, but also those occurring in the several general and post hospitals and elsewhere, so far as it has been possible to collect them. From the character of the records, it is not possible that any considerable number have escaped notice. Of the whole number of deaths 5,569 were due to wounds, accidents, and injuries; the cause of death is not stated in 1,556 instances; while 23,591 deaths were due to disease. Of these, 7,281 were from diarrhœa and dysentery, viz: acute diarrhœa, 553; chronic diarrhœa, 5,501; acute dysentery, 676; chronic dysentery, 551. If we also include 113 deaths reported from inflammation of the bowels, we shall have a total of 7,394 deaths, or about one-third of all the deaths from disease.

The number of Confederate prisoners of war is approximately known, but the average duration of their captivity cannot be ascertained with sufficient accuracy to serve for the computation of the ratio of deaths to strength from the above figures. Fortunately, however, the monthly reports of sick and wounded from the principal prison depots furnish data for computing the ratios with regard to so large a portion of the whole number as to indicate very fairly the actual facts of the case. These monthly reports, made under the supervision of the surgeons in charge, give the mean number of prisoners present during each month, together with the number taken sick, and the deaths for each disease, the form being the same as that used for the monthly reports of sick and wounded in the general hospitals. From these the following statements have been compiled:

The monthly sick reports for the depot of prisoners at Camp Douglas, near Chicago, Illinois, represent a period of three years and five months, from February, 1862, to June, 1865, inclusive. The mean number of prisoners was 5,361, the greatest mean number for any one month being 11,700 for January, 1865. During the forty-one months 13,455 cases of diarrhœa and dysentery and 698 deaths were reported, being at the rate of 735 cases and 38.11 deaths per 1,000 of mean strength annually.

* Page 776 of the Report cited on page 32—note. † Loc. cit.

The monthly sick reports for the depot of prisoners at Alton, Illinois, represent a period of two years and ten months, from September, 1862, to June, 1865, inclusive. The mean number of prisoners was 1,008, the greatest mean number for any one month being 1,721 for January, 1865. During the thirty-four months 5,580 cases of diarrhœa and dysentery and 229 deaths were reported, being at the rate of 1,954 cases and 80.18 deaths per 1,000 of mean strength annually.

The monthly sick reports from the depot of prisoners at Johnson's Island, near Sandusky, Ohio, represent a period of two years and one month, from June, 1863, to June, 1865, inclusive. During this time the mean number of prisoners was 2,114; the greatest mean number for any one month was 3,204 for December, 1864. During the twenty-five months there were 1,855 cases of diarrhœa and dysentery and 46 deaths, being at the rate of 421 cases and 10.44 deaths per 1,000 of mean strength annually.

The monthly sick reports for the depot of prisoners at Camp Morton, near Indianapolis, Indiana, represent a period of two years and one month, from June, 1863, to June, 1865, inclusive. The mean number of prisoners was 2,865; the greatest number for any one month was 4,836 for August, 1864. During the twenty-five months 2,241 cases of diarrhœa and dysentery and 315 deaths were reported, being at the rate of 375 cases and 52.77 deaths per 1,000 of mean strength annually.

The monthly reports of sick and wounded for the depot of prisoners at Camp Chase, near Columbus, Ohio, commence May 20, 1863, when 500 prisoners were reported at the post. There were at that time a large number of paroled United States soldiers at Camp Chase, and the sick reports include the sick among them and the guard, as well as among the prisoners. After the first of February, 1864, separate sick reports were made for the prisoners. Prior to that time there is no means of ascertaining the number of cases among them; but the deaths were recorded by name, and were 131 in number. Of these, 4 died of wounds, 38 of diarrhœa and dysentery, 25 of typhoid fever, and 19 of pneumonia. The separate reports extend from February, 1864, to June, 1865, inclusive, a period of seventeen months. The mean number of prisoners present was 3,570; the greatest mean number for any one month was 7,760, during February, 1865. During the period of seventeen months covered by the reports there were 4,063 cases of diarrhœa and dysentery and 226 deaths, being at the rate of 803 cases and 44.69 deaths per 1,000 of mean strength annually.

The monthly sick reports for the depot of prisoners at Rock Island, Illinois, represent a period of one year and five months, from February, 1864, to June, 1865, inclusive. The mean number of prisoners was 6,030; the greatest mean number for any one month was 8,361 for July, 1864. During the seventeen months 3,874 cases of diarrhœa and dysentery and 363 deaths were reported, being at the rate of 453 cases and 42.49 deaths per 1,000 of mean strength annually.

The monthly sick reports for the depot of prisoners at Elmira, New York, represent a period of one year, from July, 1864, to June, 1865, inclusive. The mean number of prisoners was 6,591; the greatest mean number for any one month being 9,300 for September, 1864. During the year 4,379 cases of diarrhœa and dysentery and 1,394 deaths were reported, being at the rate of 661 cases and 211.50 deaths per 1,000 of mean strength annually.

The monthly reports of sick and wounded for the depot of prisoners at Fort Delaware,

Delaware, represent a period of one year and eleven months, from August, 1863, to June, 1865, inclusive. The mean number of prisoners was 6,406; the greatest mean number for any one month being 9,174 for June, 1864. During the twenty-three months 9,659 cases of diarrhœa and dysentery and 644 deaths were reported, being at the rate of 787 cases and 52.45 deaths per 1,000 of mean strength annually.

The monthly reports of sick and wounded for the depot of prisoners at Point Lookout, Maryland, represent a period of one year and ten months, from September, 1863, to June, 1865, inclusive. The mean number of prisoners was 9,610; the greatest mean number for any one month being 19,748 for May, 1865. During the twenty-two months 20,474 cases of diarrhœa and dysentery and 2,050 deaths were recorded, being at the rate of 1,162 cases and 116.36 deaths per 1,000 of mean strength annually.

The following table presents a synoptical view of the number of cases of acute and chronic diarrhœa and dysentery at these principal depots, compiled from the monthly sick reports of each:

*Number of cases and deaths from diarrhœa and dysentery among Confederate prisoners of war at the chief prison depots, with the annual ratio per* 1,000 *of mean strength.*

| Prison Depot at— | Mean No. of prison'rs present. | Total Number of Cases and Deaths Reported. | | | | | | | | | | Annual ratio per 1,000 of strength. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Diarrhœa. | | Chronic Diarrhœa. | | Acute Dysentery. | | Chronic Dysentery. | | Total. | | | |
| | | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. |
| Camp Douglas, Ill., from Feb., 1862, to June, 1865 .. | 5,361 | 7,351 | 165 | 3,023 | 393 | 2,815 | 132 | 266 | 8 | 13,455 | 698 | 735 | 38.11 |
| Alton, Ill., from Sept., 1862, to June, 1865..... | 1,008 | 3,635 | 19 | 1,025 | 160 | 840 | 46 | 80 | 4 | 5,580 | 229 | 1,954 | 80.18 |
| Johnson's Island, Ohio, from June, 1863, to June, 1865 .. | 2,114 | 223 | 3 | 1,076 | 30 | 267 | 7 | 289 | 6 | 1,855 | 46 | 421 | 10.44 |
| Camp Morton, Indiana, from June, 1863, to June, 1865.. | 2,865 | 1,014 | 20 | 437 | 231 | 760 | 51 | 30 | 13 | 2,241 | 315 | 375 | 52.77 |
| Camp Chase, Ohio, from Feb., 1864, to June, 1865 .. | 3,570 | 2,691 | 24 | 1,103 | 191 | 187 | 9 | 82 | 2 | 4,063 | 226 | 803 | 44.69 |
| Rock Island, Ill., from Feb., 1864, to June, 1865..... | 6,030 | 1,095 | 17 | 697 | 278 | 2,016 | 51 | 66 | 17 | 3,874 | 363 | 453 | 42.49 |
| Elmira, New York, from July, 1864, to June, 1865 .. | 6,591 | 421 | 6 | 3,866 | 1,376 | 56 | 7 | 36 | 5 | 4,379 | 1,394 | 664 | 211.59 |
| Fort Delaware, Del., from Aug., 1863, to June, 1865.. | 6,406 | 6,421 | 86 | 1,747 | 442 | 1,220 | 64 | 271 | 52 | 9,659 | 644 | 787 | 52.45 |
| Point Lookout, Md., from Sept., 1863, to June, 1865.. | 9,610 | 13,555 | 286 | 2,414 | 1,282 | 3,722 | 247 | 783 | 235 | 20,474 | 2,050 | 1,162 | 116.36 |

It will be observed that this table includes 5,965 deaths from diarrhœa and dysentery, or about 82 per cent. of all the deaths from these diseases which occurred among the prisoners of war in the hands of the United States authorities; it must therefore be regarded as fairly representing their prevalence and mortality among the Confederate prisoners. At five of the nine stations the mortality ranged between 38.11 and 52.77 per 1,000 of mean strength annually, or rather more than twice the ratio of mortality from these diseases among the white troops of the United States armies during the last year of the war, and less than the mortality of the colored troops in the Central region during the year ending June 30, 1864. At one of the depots, Johnson's Island, where the prisoners were chiefly officers, it was very much less than this, being only 10.44 per 1,000. At three, Alton, Point Lookout, and Elmira, it was greater, being 80.18 for the first, 116.36 for the second, and 211.50 for the third of these stations.

It will be shown in a future chapter on the general subject of the sickness and mortality among prisoners of war that the treatment of prisoners by the United States author-

ities was very different from that which prisoners in the hands of the Confederates received. As a general rule they were housed in wooden barracks provided with ridge ventilation, and quite as good as those used for the United States troops in permanent camps. Where barracks or buildings were not provided, serviceable tents were supplied. The ration was quite liberal, and the difference in money value between the ration actually issued and that allowed to United States soldiers was credited to the prison fund, on which the surgeon in charge was authorized to draw for the purchase of vegetables and anti-scorbutics for the use of the sick. An examination of the detailed reports of the medical inspectors who visited the depots from time to time shows, however, that they were often unduly crowded; and the influence of this cause was exaggerated at Elmira by the existence in the camp grounds of a stagnant pond, into which the drainage of the camp flowed for six months of the year represented by the reports, and at Point Lookout by the malarial influences of the low tongue of land between the Potomac river and Chesapeake bay on which the depot was situated. The details with regard to each station will be presented hereafter.

Besides the reports from these principal depots there are sick reports on file for a number of minor stations, and separate reports for the scattered Confederate prisoners in some of the general hospitals.

Several thousand prisoners were sent to Hart's Island, New York harbor, in the spring of 1865, and released a few months after, the war having come to a close. Monthly sick reports for April, May, and June, 1865, are on file. The mean number of prisoners was 3,031, among whom 448 cases of diarrhœa and dysentery and 89 deaths were reported.

Reports are also on file for five months, from December, 1864, to April, 1865, from a prison depot established on Ship Island, Mississippi. The mean number present in December was 1,127, which had increased to 4,500 by April. The average number present during the whole period was 1,462, among whom 401 cases of diarrhœa and dysentery and 59 deaths were reported.

Besides these, reports are on file from the Prison hospital, (Hospital No. 2,) Louisville, Kentucky; the Gratiot street prison, St. Louis, Missouri; the prison at Little Rock, Arkansas; the Irving military prison, Memphis, Tennessee; and Fort McHenry, Maryland.

The report of the Prison hospital, Louisville, Kentucky, extends from April, 1863, to June, 1865, inclusive, with the exception of January and February, 1865, for which no reports were received. The average number of prisoners present during this period was 133. During the two years and one month the total number of cases of diarrhœa and dysentery reported was 158, of whom 7 died.

The reports of the Gratiot street prison, St. Louis, Missouri, extend from December, 1863, to May, 1865, inclusive. The average number of prisoners present was 248. During the year and a half 803 cases of diarrhœa and dysentery and 83 deaths were reported.

The reports of the prison at Little Rock, Arkansas, extend from February, 1864, to June, 1865, inclusive. The average number of prisoners present was 258. During the seventeen months 259 cases of diarrhœa and dysentery and 44 deaths were reported.

The reports of the Irving military prison, Memphis, Tennessee, extend from May, 1864, to March, 1865, inclusive. The average number of prisoners present was 48. During the eleven months 50 cases of diarrhœa and dysentery and 1 death were reported.

The reports of the prisoners confined at Fort McHenry, Maryland, extend from March, 1864, to June, 1865, inclusive. The average number of prisoners present was 186. During the sixteen months 28 cases of diarrhœa and dysentery and 6 deaths were reported.

Finally, during the course of the war a number of sick prisoners were carried from time to time to the general hospitals, where they were treated side by side with the sick United States soldiers. Separate reports of such cases were ordered to be made, but the order was not universally obeyed. Such reports are on file for various periods from the De Camp hospital, David's Island, New York harbor; the Foster hospital, Newbern, North Carolina; Hospital No. 1, Nashville, Tennessee; and the St. Louis and Barracks hospitals, New Orleans, Louisiana. These reports contain 781 cases of diarrhœa and dysentery and 239 deaths. The total number of deaths from diarrhœa and dysentery reported from these hospitals and minor stations is 528; making in all 6,493 deaths from these diseases on the monthly reports. The remaining 788 deaths contained in the alphabetical registers were reported by name from various quarters, chiefly from general and post hospitals, but simply in the form of lists of deaths, and no data exist by which the number of prisoners among whom they occurred can be ascertained.

In the foregoing section some of the more important statistical facts with regard to the prevalence of diarrhœa and dysentery during the war of the rebellion have been discussed. The reader is referred to the First Medical Volume for further details. Enough has been said to indicate the importance of a thorough study of these affections; but it may be mentioned further, as will be more fully shown in a subsequent portion of this chapter, that our experience during the war of the rebellion was very similar in this respect to what has been recorded of other armies in time of war, and particularly to what has invariably occurred during former wars in North America. Should the United States ever again put an army into the field there is every reason to believe that it will again suffer in the same way, unless, learning wisdom from experience, the military authorities take timely and efficient precautions to avert the evil. It has therefore seemed highly desirable to place upon record all that could be gleaned from the reports and other official documents in illustration of the causes, nature, and treatment of diarrhœa and dysentery, and this will be done at length in the next two sections.

The second section will contain reports and extracts from reports by medical officers relating to these diseases, and the third section such cases and autopsies as have been collected from the monthly reports, medical descriptive lists, and case-books of the general hospitals. In presenting this evidence the editor will as a rule refrain from comments, reserving any discussion of the pathology and treatment of these diseases for the fourth section, which will conclude the chapter.

## Section II.

## REPORTS AND EXTRACTS FROM REPORTS RELATING TO DIARRHŒA AND DYSENTERY.

A small number of special reports on diarrhœa and dysentery, as observed during the war, were made by medical officers, chiefly by those on duty in the general hospitals. These are presented in the following section. The sanitary reports made by the medical officers in charge of regiments, posts, and detachments also occasionally contained information on the subject. These reports were required by the regulations in force at the commencement of the war to be made quarterly. They were furnished, however, by so few of the regimental surgeons that, when the quarterly reports of sick and wounded in use before the war were replaced by the new form of monthly reports prepared by a board of medical officers in July, 1862, the separate sanitary reports were dispensed with, and instead an ample space, equal to about two pages of foolscap, for "remarks," was provided on the blanks issued for the monthly reports. This space was headed with minute "directions" as to the character of the information desired by the Surgeon General's Office. In these directions brief information was especially asked on each of the following heads, to be furnished whenever the diseases mentioned were prevalent: "*Fevers*—Their character and symptoms; an outline of the plans of treatment found most efficient, with remarks on the location and sanitary condition of camps or quarters during the prevalence of these disorders. *Diarrhœa and Dysentery*—Grade and treatment, with remarks on the character of the ration and the modes of cooking. *Scorbutic Diseases*—Character and symptoms, with observations on causation, and a statement of the means employed to procure exemption. *Respiratory Diseases*—Symptoms, severity, and treatment, with remarks on the sheltering of the troops and the atmospheric conditions. Similar remarks on other preventable diseases. Important cases of every kind should be reported in full. Where *post mortem* examinations have been made, accounts of the pathological results should be carefully prepared." The results of this plan of collecting information were not so satisfactory as was anticipated, nevertheless a number of cases and autopsies, and occasionally judicious descriptive remarks, were entered in this portion of the sick reports, and will be made use of in this and subsequent chapters.

A special effort was also made by several of the medical inspectors to collect the medical histories of the regiments in the departments to which they were attached. This was done especially by Medical Inspector E. P. Vollum, U.S.A., in the army of the Potomac in the latter part of 1862; by Medical Inspector W. H. Mussey, U. S. A., in North Carolina during the early part of 1863; and by Medical Inspector G. W. Stipp, U. S. A., in the department of the Gulf in the beginning of 1864. Much difficulty appears to have been encountered in obtaining these histories; in many regiments there had been a change of surgeons, or the records had been lost or destroyed, so that no satisfactory medical history could be obtained, and more pressing duties or other circumstances soon led to the abandonment of the effort. Hence the medical histories actually collected and preserved among the archives of the office of the Medical Inspector General represent a comparatively small number of regiments, and these for but a portion of the existence of each;

the histories collected by Medical Inspector Vollum terminating in the latter part of 1862, those by Medical Inspectors Mussey and Stipp in the early part of 1863 and 1864, respectively. Notwithstanding their fragmentary character, however, these documents contain some valuable information, and a number of extracts from them will be given in connection with the discussion of the diseases to which they refer.

In the present section the special reports on diarrhœa and dysentery will first be presented, arranged according to the date at which they were prepared. These will be followed by extracts from the sanitary reports, monthly reports of sick and wounded, and medical histories collected by medical inspectors. In the arrangement of these extracts those referring to troops in the Atlantic region will be given first, then those relating to the Central region, and as far as possible the papers coming from each great army or group of armies will be kept together in the order of their dates.

*Remarks on chronic diarrhœa, by* Acting Assistant Surgeon JAMES P. DEBRULER. *Hospital No. 2, Evansville, Indiana, August* 30, 1862.

Chronic diarrhœa has been extremely common in this hospital, and in many instances so rebellious as to defy all modes of treatment that we could devise.

*Symptoms.*—Frequent liquid evacuation from the bowels, with or without pain, variable and unnatural appetite, dry glazed tongue, with progressive emaciation, were the most prominent symptoms. Sometimes the patient loathed all food, but most generally the appetite was variable and morbid, craving unnatural and indigestible diet. Acid or sub-acid fruits, pickles, melons, &c., were generally sought for, and if obtained were commonly productive of injury. The tongue, though generally dry, was sometimes moist throughout the disease; it was almost invariably unnaturally clean. The urine was generally scanty, and often loaded with albumen to a remarkable degree. Tenderness along the course of the colon was an almost invariable symptom. In the later stages of the disease the abdomen was not unfrequently covered with an eruption of a dirty drab or slightly copperish color, the spots ranging in size from that of a split pea to a dime or even a twenty-five cent piece. I did not keep notes of this symptom so as to be able to state precisely the proportion of cases in which it occurred, but it certainly was very frequent, and I think was seen in a majority of my cases. Ulceration of the cornea occurred in some eighteen or twenty patients, all of whom were in a state of extreme emaciation. The ulcer was invariably at the same point, namely, in the centre of the lower part of the cornea. It generally occurred in both eyes. The first evidence of the affection observed was a faint whitish streak, which in a day or two was followed by an excavated ulcer with rather smooth, deep, and well-defined edges. The vascularity of the part was but slightly increased, in some instances not at all. The ulcer generally enlarged rapidly until it was large enough to hold a flaxseed or perhaps a half-grain of wheat, after which it usually remained stationary or nearly so. In one instance it perforated the corneæ in both eyes and produced total blindness. With three exceptions the patients thus afflicted died. The exceptional cases are still under treatment; two of them seem to be improving, so much so as to excite hopes that they may recover.

*Post mortem appearances.*—We have made eleven *post mortem* examinations. In all of them the mucous membrane of the colon and rectum has shown evidences of inflammation, ulceration being distinctly marked in all the cases but two; and in all the cases in which there was ulceration of the cornea, the lower third of the colon and the entire rectum were extensively ulcerated. In two or three instances the bowel was so studded with ulcers that the finger could scarcely be put upon any point of the mucous membrane without touching an ulcer. It strikes me that this constant concurrence of morbid phenomena is worthy of more than a passing thought. I think it will not do to say that the corneal ulceration depended merely upon the arrest of nutrition, for in many of our cases of typhoid fever this seemed quite as extreme as in the diarrhœa, without, however, leading to ulcers of the cornea. I should have stated above that the number of cases examined with reference to this concurrence was seven. It is hoped that others have investigated the subject.

*Treatment.*—It is perhaps unnecessary to say much under this head. Suffice it to state that mercurials, opiates, and the ordinary astringents have been worse than useless, except so far as the opiates served to relieve pain or temporarily to check the bowels. After much comparative experimenting, preference has been given to sulphate of copper, persulphate of iron, and nitric acid. These remedies variously combined, and given sometimes in large and sometimes in small doses, have, I think, done much good.

*Observations on chronic diarrhœa and dysentery, by* Assistant Surgeon SAMUEL A. STORROW, U. S. Army. *Eckington hospital, Washington, D. C., November* 17, 1862.

Chronic diarrhœa is the most common disease with which the medical staff of this hospital has to deal. The cases vary considerably in severity and in some minor symptoms, but all have the same general character. Nearly all the patients have been sick some weeks or months before coming here, as they are sent from regimental or general hospitals. In almost all instances the diarrhœa has been contracted while in field service. The general symptoms complained of are frequent desire to go to stool, and small, thin, watery evacuations, accompanied and followed by a good deal of pain and tenesmus. In some cases

the evacuations amount to twenty or more daily. There is often pain in the back, shooting down into the pelvis. Dysuria is frequently complained of, and pain in the lower part of the bladder after the organ is evacuated, and this too when the urine is perfectly normal. Some of the cases have more the character of dysentery than of diarrhœa, but in a hospital like this there is no opportunity to study carefully the alvine discharges, as it is impossible to supply a close stool for each patient. In the dysenteric cases there is great tenesmus, heat and pain about the rectum; the discharges are extremely fetid, and mixed with blood. The general color of the stools in nearly all diarrhœa cases is light, sometimes milky; and many of these patients are more or less afflicted with icterus. There is besides a dry scurfy condition of skin, with a pale waxy complexion, a dry red tongue, and general emaciation and debility. It is not uncommon to have attacks of retching and vomiting, which last a few hours and then subside. The appetite varies; it is generally poor, though sometimes very good. As regards the appearance of the abdomen it is usually flat, dull on percussion, and not tender to the touch; but when the diarrhœa is checked, either spontaneously or from the use of medicines, there is sure to be tympanites and violent pains in the belly, referred mostly to the region of the transverse colon. These pains disappear on the recurrence of the alvine discharges.

I will briefly state the result of my observations in the treatment. I have had but very few recent cases under my care. Those I have had I have treated with a purgative dose of sulphate of magnesia, followed after its operation by five grains of Dover's powder; complete rest being enjoined, with low diet for a day or two. These cases mostly got well without further trouble. Almost all our cases, however, have run on for some weeks or even months before coming here. I have tried almost all the remedies recommended for the disease. I have used opium extensively, both alone and in combination with astringents, in those cases where the discharges were merely watery, and with excellent effects. I have used the vegetable astringents, such as kino, catechu, galls, logwood, &c., and have derived benefit from them occasionally. When the discharges are dark and fetid, I have found great good from ten drops of turpentine in a drachm of mucilage taken several times a day. I have tried the much-vaunted effects of ipecacuanha in large and small doses, but have been disappointed. Observing that Surgeon Charles Tripler, U. S. A., recommends Fowler's solution in chronic diarrhœa, I tried it in a number of cases, and in some with excellent effect. I gave three drops thrice a day. Two cases which had resisted every treatment got well on quarter of a grain of nitrate of silver three times a day. Where the cases are of a dysenteric type, I have been accustomed to wrap the abdomen in warm flannel, and if there be much tenderness to apply dry cups over the tender portions. If the tenesmus does not prevent the introduction of a clyster pipe, a drachm of laudanum in two ounces of starch-water affords prompt relief, or the same effect is secured by an opiate suppository. I have promptly relieved the tenesmus of the bowels and irritability of the bladder by injecting cold water into the gut, sometimes adding a little acetate of lead. I have not used mercurials in chronic dysenteries.

The point in the treatment of chronic dysentery is not so much the particular drug given as the general management of diet and hygiene. The mildest and blandest food should be given, and that in moderate quantity. The patient should have rest as far as possible, and be kept in a dry, moderately warm atmosphere. When stimulants are required, I have found whiskey preferable to all others. Fat meat or fat soup will prevent a cure or even bring on a relapse. I have not had much opportunity of observing the *post mortem* appearances. In three cases which I examined the large intestine was inflamed, and the mucous coat of the sigmoid flexure and rectum thickened.

## *Remarks on chronic diarrhœa, by* Surgeon Charles Schüssler, Sixth Indiana Volunteers. *Hospital No. 6, Nashville, Tennessee, December*, 1862.

Diarrhœa, principally in its chronic form, appearing in all its different aspects and stages, required in most instances, and received, a discriminating symptomatic treatment, together with support for the failing strength of the patient. This disease, or rather symptom of diseases, connected with debility of the whole digestive and assimilative organs, and often consecutive to dysentery, presented itself with the prominent symptoms of inflammation of the mucous membrane of the intestine, particularly of its lower portion, which seldom failed to show itself by tenderness on pressure upon the abdomen. There was pain in the right hypochondriac region, frequent micturition of a small quantity of scalding urine, a frequent and small pulse, a tendency to coldness of the extremities, and a dry cold skin, the temperature being highest on the abdomen below the umbilicus. There was usually great thirst; the tongue was clean but of a bright red color, sometimes, however, coated, and there was dryness of the fauces. The evacuations were most frequent at night; they were liquid and often of a chocolate color. The emaciation was great. The respiration was normal when there were no pulmonary complications, but indeed the absence of these complications, as proved by *post mortem* examinations, seemed rather the exception. Nausea and vomiting were sometimes present, and then gastritis was the complication. The appetite, though sometimes lost, was mostly capricious, and any excess in eating increased the symptoms. Mental dejection was a great drawback to the cure, and the repeated relapses fostered despondency. The character of the evacuations varied much, according to the stage of the disease and the diet; they consisted of a bloody serum, clear blood of various shades, often mixed with mucus, a yellowish thin fluid, and debris of the food, which, when solid, was mostly undigested. Sometimes, however, for a day or two the food was well digested and the stools assumed a natural appearance; then all at once, without an apparent cause, they changed, and again became watery, bloody, or mucous. *Post mortem* examinations revealed an inflammatory state of the whole of the mucous membrane of the intestinal tube with the exception of the jejunum. It is true the whole tract was not involved in every individual case, but some portion of it was always affected. In some instances the mucous membrane of the stomach was normal, but in many, traces of inflammation and softening of that membrane were present. The mucous membrane around the cardia and pylorus was most frequently changed, in some instances reddened, and covered with a viscid slime; abrasions and ulcerated spots were sometimes observed. The stomach was mostly empty, with the exception of food or drink taken shortly before death. In one instance I found a scirrhous tumor the size of a pigeon's egg in the stomach. Bile or a bilious fluid was occasionally observed in the stomach. The duodenum was sometimes affected, showing tumescence of the mucous membrane and enlargement of the duodenal glands. Nothing remarkable appeared in the condition of the jejunum, but the ileum constantly offered morbid changes, and, in some instances, isolated patches where

the mucous membrane had entirely disappeared. The lower portion of the ileum was frequently tumefied, its caliber diminished, and the mucous membrane thickened, appearing like velvet of a red, brown, or bluish color. In a number of instances the ileo-cæcal valve was diseased. The colon frequently, and particularly in those cases where dysentery had preceded, presented the greatest amount of change in the condition of its mucous membrane, ulcerated spots or gangrenous disintegration being common. In a few instances where injections of a solution of nitrate of silver had been administered, I believe I could trace its healing influence as far as the injection reached, but above and in the ascending colon the diseased condition was as serious as in other cases. I should have mentioned that intussusceptions of the ileum were observed in three instances. One of the most prominent features of the disease was the amount of bile contained in the gall-bladder. This was almost always found, even when little change could be observed in the liver. The spleen was usually found enormously enlarged. The kidneys also were often enlarged and fatty, so far as could be judged by the naked eye. The pulmonary complications were often proved by dissections to be the consequence of tubercular or other predisposing or pre-existing morbid conditions of the respiratory organs. The frequency and extent of the morbid changes of the organs of respiration were really remarkable, bronchitis and pneumonic hepatization in its different forms being met with in very many cases where diarrhœa had formed the prominent disease. * * * This disease is due to the unavoidable circumstances of camp life, the food, its cooking, irregularity in meals, differences in the drinking-water, fatigue, &c. * * * No specific remedy or routine method of treatment is to be thought of, and great importance attaches to appropriate food and drink.

In the treatment of cases received into hospital, when not contra-indicated, I ordered an opiate in the form of Dover's powder or paregoric. In those cases where irritation of the mucous membrane, from the presence of undigested food or other irritants, was prominent, I gave from one to two ounces of castor oil, with a drachm of spirits of turpentine and some laudanum. I also administered mucilaginous drinks. Sometimes I preferred Epsom salts as a substitute for the castor oil. I gave the patient an anodyne after the operations, and sometimes repeated it, as also the aperient. In the hepatic complications, or when the evacuations were clay-colored or small and painful, containing much mucus, I preceded the above by an alterative, as blue-mass, or mercury and chalk, rarely by small doses of calomel, either combined with opium or followed by a Dover's powder. This plan of treatment was also pursued in bilious diarrhœa, in connection with small doses of ipecacuanha. Local applications to the abdomen were never neglected. Soft poultices of linseed, with or without mustard, aromatic embrocations, or flannel bandages were employed. Ipecacuanha, in small doses, has also been a favorite medicine. When the stomach was decidedly acid I have obtained good results from a mixture of rhubarb and carbonate of magnesia, with mint or camphor-water and paregoric. In those cases in which the evacuations were copious and very frequent, I resorted to astringents, generally combined with opium and aromatic powder. The dilute sulphuric acid which has been so highly recommended I have tried fairly. I have also used the elixir of vitriol with laudanum, one drachm of each in a six-ounce mixture, a tablespoonful three or four times daily, generally conjoined with a strong infusion of oak bark. It has done well in some instances. In those cases where gastrodynia existed, with general nervous derangement and paroxysms of pain not increased by pressure, I have used subnitrate of bismuth, with and without opium, with some success. Solution of acetate of ammonia and laudanum, emollient narcotic cataplasms to the abdomen, benzoic acid, with mucilage of gum arabic and laudanum, have also been used with benefit. Creasote has been a favorite medicine in advanced cases, and where danger of gangrene of the mucous membrane, indicated by the fetid discharges and other collateral symptoms, seemed present. The sulphate of magnesia, in from eight to sixteen-grain doses, with quarter to half a grain of opium, three times daily, and free draughts of flaxseed tea, seemed beneficial in sub-inflammatory cases. A turpentine mixture, consisting of mucilage, oil of turpentine, and olive oil, well rubbed together with cinnamon-water, was often highly beneficial; an opiate was usually added, and sometimes the nitrate of silver in one to five grains to the ounce of mixture. One-eighth to one-half a grain of nitrate of silver with opium, extract of hyoscyamus, or extract of conium, in the form of pills, repeated every eight or ten hours, was regarded as useful in those forms of long standing in which ulceration of the intestine was rendered probable by the symptoms. The preparations of iron, such as the muriate, the sulphate, and the persulphate, either alone or in combination with bitter aromatics, have also proved of value. They required, however, as all the astringents and tonics, good discrimination in each individual case. Tannin was used when the debility was great and the system somewhat prepared by aperients, antacids, bitters, &c. Under the same circumstances I often preferred the acetate of lead from its tendency to increase the secretion of the kidneys, [?] which the tannin rather diminishes. I have also found alum useful. Much depended on the combination of these remedies with aromatics and anodynes, and the form in which they were given. The milder astringents, as kino, catechu, &c., were very useful in combination with bitter extracts. Camphor in small doses was a valuable adjuvant; it formed an important ingredient in our aromatic powder. Spirituous liquors, though indispensable, I cannot regard as curative. Quinine in diarrhœa, though often resorted to, has not fulfilled my expectations in either field or hospital practice; however, infusion and decoction of Peruvian bark, and particularly in combination with iron and aromatics, have proved of much service. Injections per anum, when properly administered, have protracted life in many bad cases, and relieved some patients when internal medicines seemed of little effect. For this purpose I used emollient or astringent emulsions, carminatives, flaxseed tea, sweet oil and laudanum, starch-water and sweet oil, acetate of lead and laudanum, chamomile tea, infusion of mint, &c. Sometimes, where much pain and some tenesmus existed, I used injections containing a small quantity of extract of belladonna with the solution of nitrate of silver. * * * *

## *Remarks on the treatment of chronic dysentery, by* Acting Assistant Surgeon Richard A. F. Penrose.* *Satterlee hospital, Ward II, West Philadelphia, March* 2, 1863.

This hospital has been from its organization in June, 1862, almost entirely filled with chronic cases of disease. It may be really said to receive, as it were, the siftings of other hospitals. All cases of mild character, or of men possessing good constitutions, get well in the hospitals to which they may originally be sent, while those which are severe, or occur in men of

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weak or bad constitution, resist treatment, and after the lapse of weeks or months are crowded out and sent off to try the effects of change of air.

Another peculiarity which strikingly characterizes our patients is the large number of malingerers, whose skill and art in deception have enabled them to convince even competent medical men that they are really suffering from grave disease, when, in fact, they are perfectly well. These, therefore, are the kind of cases we are called upon to treat, viz: on the one hand, cases which have lasted often for months, and have already been subjected to all the ordinary treatment, occurring very frequently in men possessing some radical vice of constitution, and in whom alteration of structure or perversion of function has existed until they have become from habit so fixed as to characterize the individuals almost as if by some natural idiosyncrasy; or, on the other hand, most artful and successful malingerers.

In selecting from such material instructive cases for a report, I have chosen instances of chronic dysentery or diarrhœa, as belonging to the most numerous as well as the most indomitable and intractable of the various diseases coming under our observation, except perhaps rheumatism. These bowel affections, too, are pre-eminently the diseases of the camp, sometimes most fatal in their primary attack, while, in other instances, most surely laying the foundation of disease which ultimately brings the victim to an untimely end. The writer of this communication saw this painfully proved after the Mexican war, during a residency of three years in the wards of the Pennsylvania hospital, some two or three years after the termination of that war. He frequently met cases of chronic dysentery in the hospital wards in men whose sickness originated during the campaign in Mexico. When any of these men died, extensive ulcerations were invariably found in the colon or rectum, or in both, showing why the disease had lasted so long, as well as indicating clearly the rationale of treatment. No opportunity has been afforded for pathological investigations, in the instances of these affections, coming as yet under our observation in this ward of the hospital, save in two cases, and both of these had completely recovered from their bowel affections and died, as the examination after death revealed, from other diseases—one from phthisis and the other from great debility following very severe miasmatic fever contracted on the Peninsula. In both numerous recent cicatrizations of ulcerated surfaces were evident.

The treatment, therefore, which has been carried out in this ward is based on the following view of the pathology of the complaint, viz: that in almost every instance there is chronic inflammation, morbid alteration, or absolute ulceration of the mucous membrane, generally of the large intestine; that, therefore, the treatment ordinarily demanded in the recent or acute stages of the disease is not only useless but injurious, and that our therapeutics, to be successful, must always be applied in reference to the condition of the intestinal mucous membrane. In accordance with these views the treatment has been as follows: First, a most rigid system of dietetics, allowing only bland and unirritating food, and such as would be entirely digested in the upper part of the intestinal tube; in other words, food with no debris to irritate the surface of the large intestine—food, however, most nourishing in its character, as farinaceous preparations, with some milk, whey, eggs, mucilages, essence of beef, chicken soup, &c. In addition to diet, attention to the condition of the surface has been deemed highly important, and hot baths, when procurable, have been largely used. Stimulating frictions with turpentine or capsicum, applied to the extremities and abdomen, have been found very advantageous. Attention to the clothing is also required.

Often in chronic dysentery the most scientific and vigorous treatment will fail unless this rigid system of diet is observed, and the relationship of the skin to the mucous surface ever recollected. Among the medicines used I mention foremost, as almost universally successful, mixtures containing the mineral acids. Of all the cases treated, less than one-sixth perhaps failed to be immediately benefited by them, and in the majority the acid with diet was all that was required to complete the cure, often even in cases that had lasted for months.

Opium, of course, has been necessary, a very favorite method of administration being injections of the tincture into the rectum. When ulcerations of the rectum have been suspected, injections of the sulphate of zinc with laudanum, or nitrate of silver with the same, have been ordered, and often with the happiest results. The vegetable astringents were often used, but were found to palliate rather than cure; they were, however, sometimes directed, as much for a change as for any other reason, in cases which were very chronic, and where the improvement though positive was slow, and where the stomach seemed to become disordered by a long persistence in some one remedy. In a few cases nitrate of silver, in others turpentine, acted very well; in the majority they proved useless or injurious. The salts of iron and the sulphate of zinc were used without satisfactory results. The remedies which have been most positive in their results, after the acids and opium, have been nutmeg and the oxide of zinc, and the author of this communication claims originality in using them in the disease under consideration. The nutmeg was directed as an aromatic and anodyne, conveyed most probably to the ulcerated surface and there producing its beneficial effects. The oxide of zinc was given with the view of having it carried directly to the seat of disease, being perfectly acceptable to the stomach, and if acted on by the acids of the intestines only made more astringent, while its ordinary effects were mild astringency, tonic, and, perhaps, anodyne or sedative effects locally. Most generally these remedies have been used combined, and very few cases have failed to respond to their influence.

With these prefatory remarks, we state that in Ward H there have been treated, from June 9, 1862, to February 1, 1863, forty-seven cases of chronic dysentery and diarrhœa. In some the symptoms were of the gravest character, and the patients seemed reduced to the last extremity, and of these forty-seven, all recovered. Two died, as already stated, from other causes; but in these instances the symptoms during life, and the state of the intestines after death, only proved how absolutely they had recovered from their bowel affection.

In illustration of the views expressed, a history of three of the worst cases received into the ward is appended. These men were extremely ill when admitted, and for a long time had suffered from constant relapses, in which often the remedies before most successful seemed powerless and new plans of treatment became necessary. All of these men finally completely recovered and returned to their regiments.

CASE 1. Ward H, bed No. 17.—Corporal George A. Spring, company G, 27th New York volunteers; admitted July 7, 1862. This man had been taken sick with dysentery in April, 1862, and was sent to his regimental hospital, where he remained until June, when he returned to duty, only however to be seized almost immediately with a severe relapse. He was sent north from Harrison's Landing in the beginning of July. When admitted he was found very much exhausted and emaciated, with

some fever, a frequent pulse, hot dry skin, red coated tongue, and very frequent small stools, which sometimes contained blood. He had a great deal of abdominal pain and soreness on pressure. He was at once placed on the following acid mixture: ℞. Nitro-muriatic acid three drops, tincture of opium five drops, camphor-water half an ounce, water four ounces. The whole given every three hours. Diet: Essence of beef, and arrow-root prepared with milk and water. To take at bed-time an injection of sixty drops of laudanum in half an ounce of water. Under this treatment the man began at once to improve. July 9th: No fever, tongue cleaner, a good deal of pain. The injection enables him to get an uninterrupted night's rest; the stools, originally from twenty to thirty per day, have been reduced to from ten to fifteen in the same period. Medicines continued. July 12th: Very great improvement, tongue almost perfectly clean; but little pain most of the time, but occasionally he suffers considerably; from six to eight stools per day. July 20th: Is almost well. Three or four stools in the twenty-four hours; little pain, good appetite. Continue acid, stop injections. August 1st: Acid reduced to three doses in the day. Patient appears well. August 7th: Is taking no medicine. August 20th: Has had a severe relapse; frequent bloody evacuations, much pain, coated tongue. Renewed the acid, but after a few days' trial found that it failed to produce its former results. August 25th: Worse; tongue red, with a strong disposition to dryness; passages as before. Acid discontinued. ℞. Oil of turpentine ten drops, tincture of opium five drops, syrup of gum arabic half an ounce. Take the whole every two hours. August 30th: Is better; the tongue has lost its redness, is moist; still he has six to eight stools a day and a good deal of pain in the rectum, with much tenesmus. To continue the turpentine in half doses, and to have injections of eight grains of sulphate of zinc and half a drachm of laudanum in four ounces of water, night and morning. This acted very well. September 5th: Reports himself well. No medicine. September 10th: As he is pale and anæmic, ordered ten drops of tincture of chloride of iron six times daily. September 12th: The iron has brought on the old looseness. Stopped at once. To take an injection of laudanum at bed-time. September 28th: Still has from four to six stools per day; tongue red. Ordered turpentine mixture as before. October 6th: About the same. Stop turpentine and take four times daily a pill of nitrate of silver quarter of a grain, opium half a grain, on an empty stomach; also repeated injections of sulphate of zinc. October 8th: The injections have produced a good deal of irritation. Stopped. The nitrate of silver does not seem to do any good. Stopped. No medicine. October 9th: Still has about four to eight stools per day. To try again the turpentine mixture. October 26th: Better, but some looseness. Stop turpentine. Take twelve drops of laudanum and a drachm of the tincture of krameria three times daily. Frictions of turpentine night and morning to extremities and abdomen. November 20th: Has been quite well for some days. No medicine. November 26th: Took cold, and a severe relapse followed. ℞. Castor oil half an ounce, laudanum thirty drops. Very rigid diet, &c. December 1st: Better. Renew the krameria mixture. December 8th: Stop krameria. ℞. Nutmeg ten grains, oxide of zinc ten grains. Take six times daily. This man now rapidly convalesced and became fat and ruddy. Sometimes a slight relapse occurred, for which castor oil and laudanum, with very rigid diet, were directed, the nutmeg and zinc being resumed as soon as the symptoms permitted. December 30th: Perfectly well. No medicine.

Case 2, Ward H, bed No. 47.—Private Joseph Westurn, company G, 16th New York volunteers; admitted July 7, 1862. This man was taken with dysentery in June, and sent to hospital at Harrison's Landing; from thence here. When admitted he presented all the symptoms of severe dysentery, complicated, however, with remittent fever; was very much exhausted and emaciated. ℞. Sulphate of quinia one drachm, dilute sulphuric acid one drachm, water five ounces. Dose, half an ounce every two hours; opiate injection at bed-time; rigid diet. July 12th: All fever has disappeared. Dysenteric symptoms still very severe, but better than when admitted. Quinine stopped—injections continued. The acid mixture used in case No. 1 ordered every three hours. Under this treatment alone this man very rapidly improved, until, by July 26th, he had but one stool in the twenty-four hours. His acid mixture was now discontinued, and as there were some traces of a miasmatic affection hanging about him and he was yet very much prostrated, he was ordered a drachm of compound tincture of cinchona and half an ounce of brandy every four hours, with full diarrhœa diet. From this time he grew better, until by August 11th he seemed perfectly well. August 17th: He has had a severe relapse. ℞. Castor oil half an ounce, laudanum thirty drops; absolute diet. August 20th: Acid mixture. August 22d: Is very much prostrated; feeble, frequent pulse; dry, very red tongue; stools every hour or even more frequently; great epigastric uneasiness. Continue the acid. August 26th: This man now for over a week has been very ill; cannot retain his opiate injections; the acid does not arrest the complaint; tongue intensely dry and red. Stop acid and take turpentine mixture, as given in case No. 1, every two hours. This acted almost like magic upon him. His stools at once diminished in frequency; his tongue in a few days became moist and covered with a thin white fur; his appetite improved. September 14th: Very much better. Still has about four stools daily. Turpentine diminished one-half. September 27th: Is looking very well; begins to pick up flesh; about three to six stools a day; tongue somewhat red; turpentine stopped. ℞. Nitrate of silver quarter of a grain, opium half a grain, four times daily on an empty stomach. This seemed to do much good, and in a few days he appeared nearly well. October 1st: One stool only in twenty-four hours; continue the silver. October 4th: He had a severe relapse; for the next two or three weeks no medicines seemed to produce the slightest effect on him; he had much pain and from six to fifteen stools daily. During this period he used acid mixture, turpentine mixture, pills of two grains of acetate of lead and quarter of a grain of opium every two hours, one drop of creasote in half an ounce of syrup of gum arabic three times daily, also krameria and opium, all with little or no effect. November 3d: All medicine discontinued; rigid diet. November 9th: Ordered ten grains of oxide of zinc six times daily. This acted very well, and by November 15th he was much improved. Ordered now, in addition to the zinc, turpentine frictions to the extremities and belly twice daily. Under this treatment he rapidly improved; had an occasional day or two of looseness, but gained steadily in flesh; became very rosy, and December 11th returned to his regiment.

Case 3, Ward H, bed 23.—Private Eugene F. Wright, company K, 2d Vermont volunteers; admitted July 10, 1862. Has had dysentery since the first of June. Was sent to Harrison's Landing; from thence here. This man was pale and emaciated; had about twenty stools in the twenty-four hours, but no blood and no marked fever; his tongue was thickly coated with a yellowish-white fur, and he had considerable pain. Ordered the acid mixture given in the previous cases. July 20th: Is very much better, not more than five or six stools daily; tongue cleaning rapidly; acid continued, but has only four doses in the

twenty-four hours. August 2d: Diarrhœa checked; no medicine; full diarrhœa diet. August 15th: Some return of the diarrhœa; renew the acid. August 25th: Still too much looseness; stop the acid; try the turpentine mixture. September 7th: Turpentine does but little if any good; stop it. Take, morning and night, the following injection: ℞. Nitrate of silver five grains, laudanum half an ounce, water an ounce. This gave very great relief, and under its use he was brought to one or two stools daily, when it was discontinued. September 15th: ℞. Nitrate of silver quarter of a grain, opium half a grain, four times daily; still some looseness. September 20th: Gave, in addition to the pills of nitrate of silver, ten grains of nutmeg every two hours. This acted remarkably well, and in a week he was reduced to about one stool in thirty-six hours; indeed, frequently he became so constipated as to require a dose of castor oil. October 10th: He has had a relapse, fifteen to twenty stools per day, great pain, &c.; to take a dose of castor oil and laudanum; rigid diet. October 12th: Is better; still ten to twelve stools; renew the acid mixture. October 18th: Still has frequent stools; try the krameria mixture with turpentine frictions. November 1st: Very much better; getting fat. November 9th: Has about six stools per day; stop krameria—continue frictions; take oxide of zinc and nutmeg, ten grains each, every two hours. November 20th: Has from one to four stools per day; continue the zinc and nutmeg, and use krameria. December 10th: Is well; sometimes has a slight looseness, for which he uses the krameria, and also takes regularly ten grains of nutmeg every two hours. This man continued to improve, and became, as the two others, very fat and rosy, and on January 23d returned to his regiment.

## *Treatment of diarrhœa by Liquidambar Styraciflua, (sweet gum,) by* Acting Assistant Surgeon J. V. C. Smith. *St. James hospital, New Orleans, September and October,* 1863.

Among the medical descriptive lists for 1863 are brief reports of thirty-three cases of diarrhœa treated by Acting Assistant Surgeon J. V. C. Smith, in the St. James hospital, New Orleans, with the decoction of the bark of the *Liquidambar Styraciflua,* (sweet gum tree.)

Dr. Smith remarks: "The decoction has been used throughout the entire season in this hospital with marked success. Nearly all the fatal cases of diarrhœa might apparently have terminated more satisfactorily if the patients had been sent more seasonably to the hospital; they are rarely allowed to leave the ranks until they are unable to stand."

The following is a list of the cases:

| Names. | Rank. | Regiment. | Company. | Date of Admission. | Result. |
|---|---|---|---|---|---|
| Charles Howland | Private | 14th N. Y. cavalry | A | September 10, 1863 | Returned to duty October 1, 1863. |
| S. R. Williamson | Sergeant | 12th Mass. battery | ..... | " 13, " | " " " 1, " |
| F. H. Bailey | Private | 8th Ind | F | " 14, " | " " " 3, " |
| Charles Hoffman | " | 133d N. Y | E | " 15, " | " " September 28, 1863. |
| George H. Neal | " | 14th Maine | I | " 15, " | " " " 25, " |
| Frederick Preston | Corporal | 161st N. Y | F | " 15, " | " " " 25, " |
| Daniel A. Starke | Private | 161st " | F | " 15, " | " " " 25, " |
| J. B. Cole | " | 161st " | H | " 15, " | " " " 26, " |
| Daniel Roberson | " | 161st " | B | " 15, " | " " " 24, " |
| Joseph Haskell | " | 14th Me | D | " 15, " | " " " 28, " |
| John Steinal | " | 14th N. Y. cavalry | B | " 15, " | " " October 5, 1863. |
| Albert Morgan | " | 14th " " | A | " 18, " | " " " 1, " |
| John Bennett | " | 173d N. Y | A | " 22, " | " " " 1, "* |
| Bernard McNulty | Musician | 12th Mass. battery | ..... | " 23, " | " " " 1, " |
| Charles Roper | Drummer | 75th N. Y | E | " 24, " | " " " 1, " |
| C. H. Kinson | Sergeant | 1st Vt. battery | ..... | " 25, " | On duty as nurse.† |
| Jacob A. Crapliver | Private | 46th Ind | D | " 26, " | Returned to duty October 12, 1863. |
| L. J. Hill | " | 56th Ohio | G | " 26, " | " " " 1, " |
| Benjamin Wilbur | " | 29th Wis | E | " 26, " | Died October 20, 1863. |
| Daniel Lepley | " | 34th Ind | A | " 26, " | Returned to duty October 5, 1863. |
| Daniel Andrews | " | 28th Iowa | G | " 26, " | " " " 1, " |
| Levi Strome | " | 28th " | B | " 26, " | Died September 28, 1863. |
| William Wood | " | 46th Ind | K | " 26, " | Returned to duty October 26, 1863. |
| Thomas Monahan | " | 38th Mass | B | October 3, 1863 | " " " 13, " |
| William Mitchell | " | 18th Ind | C | " 3, " | " " " 15, " |
| James Eddy | " | 99th Ill | G | " 3, " | " " " 14, " |
| William Johnston | " | 14th N. Y. cavalry | A | " 3, " | Discharged service " 19, ‡ |
| C. H. Robinson | " | 11th Wis | A | " 4, " | Died October 8, 1863. |
| W. H. Oattiker | " | 11th " | E | " 4, " | Returned to duty October 10, 1863. |
| Elias Means | " | 23d Iowa | G | " 4, " | " " " 19, " |
| Curtis Anesley | " | 54th Ind | C | " 4, " | Died October 8, 1863. |
| Allen Campbell | " | 12th Conn | G | " 16, " | Returned to duty October 25, 1863.‡ |
| Hiram Cromett | " | 5th U. S. artillery | ..... | " 17, " | " " " 26, " § |
| | " | | | | |

* According to the hospital register Bennett was discharged for disability October 19, 1863.

† According to the hospital register Kinson returned to duty November 16.

‡ According to the hospital register Campbell was not returned to duty until December 21.

§ According to the hospital register Cromett remained at the hospital until December 4th, when he was furloughed to report at Fort Hamilton, New York harbor.

### *Treatment of chronic diarrhœa by infusion of Cistus Canadensis, (Helianthemum, U. S. Pharmacopœia.) Extract from the Report of* Surgeon JOHN T. HODGEN, U. S. Volunteers. *City hospital, St. Louis, Missouri, for April*, 1863.

I desire to mention the value of the *Cistus Canadensis* as a remedy in chronic diarrhœa. The article has been used at this hospital during the past year in the form of a hot infusion. One ounce of the herb is taken and one or two quarts of boiling water poured on it; to be used when cold, as a drink, by the patient suffering from chronic diarrhœa. Excellent results have followed its use, and I do not hesitate in saying that more patients suffering from this disease have been benefited by it than by all other remedies. The tea has an aromatic and slightly bitter taste, and is taken without a sense of disgust even when continued for a considerable length of time. I am satisfied that the army would be much benefited by its general introduction.

### *Diarrhœa treated with Injections of Nitrate of Silver at the Judiciary Square hospital, Washington, D. C., during the summer of* 1863.

[The case-book of Judiciary Square hospital, Washington, D. C., contains notes of fifteen cases of diarrhœa treated, during 1863, with injections of nitrate of silver, ten or fifteen grains to the ounce of water, with or without laudanum. The first case entered in the book is signed by Assistant Surgeon A. Hartsuff, U. S. A., temporarily acting as surgeon in charge,* by whom it is understood the majority if not all the cases were treated. To the account of each case as recorded in the case-book the subsequent history of the patient, whenever it has been possible to obtain it, is appended.]

CASE 4.—Private Joseph Brinker, company E, 11th Pennsylvania volunteers; admitted April 2, 1863. Compound comminuted fracture of the right femur from a musket bullet. June 15th: The patient was attacked by diarrhœa, having six discharges during the day, for which opium pills were prescribed. June 20th: The diarrhœa still continuing, ordered pills of tannin and opium, one grain each. June 25th: ℞. Persulphate of iron ten grains, opium five grains, capsicum ten grains; make ten pills. Take one every four hours. June 30th: The diarrhœa still continues, averaging five stools daily. ℞. Nitrate of silver fifteen grains, water an ounce. Use as an enema. July 10th: Has had but one passage daily since the enema. [This man was discharged the service March 3, 1865. His right thigh had been amputated in the upper third.]

CASE 5.—Private John Burk, company I, 23d Maine volunteers; admitted April 7, 1863. Diarrhœa of five weeks' standing. Ordered rest, tonics, and astringents. April 9th: There being as yet no improvement, the following was ordered: ℞. Nitrate of silver ten grains, laudanum thirty drops, water one ounce. Use as an injection. This was retained one hour. May 17th: The patient has had for some time but one dejection daily, and may be regarded as cured.

CASE 6.—Private Charles Shank, company H, 4th New York cavalry; age 54; admitted April 29, 1863. Diarrhœa of seven weeks' standing, with from five to eight discharges daily. The stools were thin and colorless. Ordered acetate of lead and tonics. May 1st: The diarrhœa still continues. ℞. Nitrate of silver ten grains, tincture of opium twenty-five drops, water one ounce. Use as an enema. This was retained one hour, after which the patient had but one action per day until he was transferred to general hospital in Philadelphia, several days afterward. [The case-book of Satterlee hospital, Philadelphia, shows that this man was admitted to that hospital May 7th, still suffering from diarrhœa. He also had difficulty in passing water, pain in the region of sacrum, and tenderness along the track of the colon. To take every two hours a pill containing two grains of acetate of lead and half a grain of opium. Mustard plaster to abdomen. Milk diet. May 16th: The patient remains about the same. Discontinue the pills. ℞. Tincture of catechu half an ounce, compound tincture of gentian three ounces and a half. Take a tablespoonful three times daily. May 21st: Bowels constipated. Stop the tincture of catechu and give an ounce of castor oil with twenty-five drops of laudanum. May 25th: The diarrhœa has returned since the oil operated. Renew the tincture of catechu and gentian. May 27th: Substitute Hope's camphor mixture. June 24th: The diarrhœa still continues; the evacuations are abundant and watery. The patient complains of intense rheumatic pains, and a certain stiffness is evinced in all his motions. Ordered ten grains of powdered nutmeg every two hours, and a chloroform liniment. June 27th: The diarrhœa has ceased but the rheumatism still continues. ℞. Iodide of potassium one drachm, wine of colchicum root one drachm, compound tincture of gentian two ounces. Take a teaspoonful three times a day. July 1st: The diarrhœa has returned. The patient complains of cramps in the stomach. Prescribed an aromatic mixture containing ginger and paregoric; subsequently resumed the powdered nutmeg. July 10th: The patient appearing to be nearly well, treatment was discontinued, and he was put on duty in the drug store. July 13: The diarrhœa having recurred, he was returned to the ward and treatment was resumed. He was transferred to convalescent hospital July 30th. The register of the convalescent hospital, corner of 16th and Filbert streets, reports him admitted August 1, 1863. Chronic rheumatism. Transferred to the 2d battalion, Veteran Reserve Corps, November 15th.]

CASE 7. Lieutenant L. E. Holdridge, company L, 4th Pennsylvania cavalry; admitted April 29, 1863. Diarrhœa. The patient had been sick four or five months, having from six to ten passages daily. The stools were thin, almost colorless, and had but little odor. He was put to bed and treated with tonics and astringents without benefit for some days, when the following was ordered: ℞. Nitrate of silver ten grains, laudanum twenty-five drops, water an ounce. Use as an enema. During the twenty-four hours after the injection the patient had but one passage, and that was of more consistence than previous stools. After twenty-four hours the injection was repeated, and the diarrhœa was completely checked. [The patient was transferred to Philadelphia May 6th. The records of Satterlee hospital, Philadelphia, show that this man was admitted May 7th—diagnosis, diarrhœa. Returned to duty May 18th.]

CASE 8.—Lieutenant Clark E. Bates, company I, 2d Rhode Island volunteers; admitted May 8, 1863, with compound comminuted fracture of the right thigh by a musket bullet. Diarrhœa set in June 20th. Ordered thirty drops of laudanum,

* In the absence of Assistant Surgeon E. J. Marsh, U. S. A.

followed by chalk mixture. June 29th: The diarrhœa still continues, the passages averaging four daily. ℞. Nitrate of silver ten grains, laudanum twenty-five drops, water one ounce. Use as an enema. This was retained one hour. July 2d: Has had three passages to-day. Repeat the injection. July 7th: Has had but one or two passages of good consistence daily since the last note. [This officer died July 18, 1863, from the effects of his wound.]

CASE 9.—Private William Moss, company F, 122d New York volunteers; admitted June 13, 1863. Diarrhœa consecutive to typhoid fever. The patient was unable to give any account of his sickness, and had a profuse diarrhœa, the discharges being involuntary. ℞. Nitrate of silver ten grains, laudanum twenty-five drops, water one ounce. Use as an enema. This was retained a quarter of an hour. June 14th: Since the last note the patient has had four large and thin discharges from the bowels. ℞. Nitrate of silver fifteen grains, water one ounce. Use as an enema. June 17th: Has had but one discharge since the injection; it was large and thin. June 20th: Four discharges within the twenty-four hours. ℞. Nitrate of silver twenty grains, water one ounce. Use as an enema. June 22d: Has had but one action from the bowels since the last note. July 1st: The patient has had but one stool daily since the 22d. His fæces are now consistent and healthy in appearance. [This man deserted from hospital September 30th.]

CASE 10.—Private Horace O. Hill, company I, 27th Connecticut volunteers; admitted June 13, 1863. Chronic diarrhœa, from which he has suffered four months, having from six to twelve passages daily. Ordered the following: ℞. Nitrate of silver ten grains, laudanum twenty-five drops, water one ounce. To be used as an enema. This was retained half an hour. June 14th and 15th: The bowels were not moved. June 16th: There were three movements this morning, being the first since the injection. ℞. Nitrate of silver fifteen grains, water one ounce. Use as an enema. June 20th: The patient has now but one consistent stool per day. July 1st: Transferred to another hospital. [The records of Lovell hospital, Portsmouth Grove, Rhode Island, show that this man was admitted to the hospital July 3d—diagnosis, chronic diarrhœa—and that he was discharged the service July 30th, by reason of expiration of term of service.]

CASE 11.—Private David Watson, company D, 16th Massachusetts volunteers; admitted June 17, 1863. Diarrhœa of ten weeks' standing, with from six to eight discharges per day. Gave astringents, such as tannic acid, acetate of lead, &c., with opium, but effected no change in his condition. June 30th: Ordered the following: ℞. Nitrate of silver ten grains, laudanum twenty-five drops, water one ounce. To be used as an enema. The injection was retained an hour. June 21st: The patient seems much better, and has had but one passage from the bowels since the last note. The fæces are more consistent. July 1st: There has been but one stool per day since the injection. The diarrhœa may be considered cured. The patient is transferred to a northern hospital to recruit his strength. [The register of Lovell hospital, Portsmouth Grove, Rhode Island, shows that this man was admitted to that hospital July 3d—diagnosis, diarrhœa—and that he was transferred to the Veteran Reserve Corps March 31, 1864, on account of the loss of his left thumb by amputation.]

CASE 12.—Private Wellington McSparren, company F, 169th Pennsylvania volunteers; admitted July 11, 1863, with diarrhœa of three weeks' standing. ℞. Nitrate of silver ten grains, laudanum twenty-five drops, water one ounce. Use as an enema. This was retained one hour, after which the patient had but one passage daily until July 14th, when he had seven passages during the twenty-four hours. The injection was then repeated, after which the patient had but one stool daily, and was discharged cured July 21, 1863.

CASE 13.—Private Mahlon Shaffer, company C, 167th Pennsylvania volunteers; admitted July 12, 1863. Diarrhœa of three months' standing. The discharges numbered from five to ten per day; they were thin and colorless. Astringents were employed without benefit for several days, when an enema of fifteen grains of nitrate of silver, dissolved in an ounce of water, was administered, with the effect of promptly checking the diarrhœa. The patient was returned to duty August 7th.

CASE 14.—Private Thomas H. Ande, company G, 178th Pennsylvania volunteers; admitted July 14, 1863. Diarrhœa of five weeks' standing, with from four to ten passages daily. The patient was emaciated and had no appetite. Rice diet was ordered, perfect rest enjoined, and astringents prescribed—all to little purpose. Ordered the following: ℞. Nitrate of silver ten grains, laudanum twenty-five drops, water one ounce. Use as an enema. This was retained half an hour, after which the patient went ten hours without a stool. The passages were then altered in character, being thicker and more natural. From this time he had only one stool daily. Returned to duty July 20th.

CASE 15.—Private Lewis Huber, company G, 179th Pennsylvania volunteers; admitted July 14, 1863. Diarrhœa of three weeks' standing; four to eight thin, colorless passages daily. Ordered perfect rest, astringents, and milk diet, without benefit. July 16th: Ordered the following: ℞. Nitrate of silver ten grains, laudanum twenty-five drops, water one ounce. Use as an enema. This was retained half an hour, after which the patient had but one passage daily, and was returned to duty cured July 20th.

CASE 16.—Private David F. Burt, company A, 130th New York volunteers; admitted July 18, 1863. Diarrhœa of seven months' standing. The patient was weak, emaciated, and had no appetite. He had from six to twelve passages daily. Ordered good diet, stimulants, and astringents—tannin, opium, lead, &c.—which diminished the number of discharges to from four to eight. In this condition the patient remained without further amendment until July 31st, when an enema of fifteen grains of nitrate of silver, dissolved in an ounce of water, was ordered. This was retained about an hour. From this time the evacuations became natural in appearance, and were reduced in number to one or two daily. The patient was returned to duty September 24, 1863.

CASE 17.—Corporal John Webster, company G, 2d New York cavalry; admitted July 24, 1863, from Yorktown. Diarrhœa. The patient had been sick about four weeks, and was weak and emaciated. He had from four to fifteen thin, light-colored, nearly odorless stools daily. July 25th: Ordered quinine, with tannin and other astringents combined with

opium. This treatment was continued three days without benefit. July 29th: Ordered the following: ℞. Nitrate of silver fifteen grains, water one ounce. Use as an enema. This was retained twenty-five minutes. The stools were at once reduced to but two daily, and became quite consistent. The patient soon recovered entirely. [He deserted December 31, 1863.]

Case 18.—Private Henry S. Davis, company B, 49th Pennsylvania volunteers; admitted September 10, 1863. Diarrhœa of four months' standing. The patient was much emaciated, and had from five to ten passages daily. Astringents were administered without effect, and the first injection of nitrate of silver, fifteen grains to the ounce of water, produced but little benefit. The injection was repeated, when the patient began to improve, and after a third repetition recovered completely. Transferred to general hospital in Philadelphia September 23d. [The register of Mower hospital, Philadelphia, shows that this man was admitted to that hospital September 24th—diagnosis, chronic diarrhœa—and was returned to duty November 16th.]

## *Letter to the* Surgeon General *on the use of Peanuts (nuts of Arachis hypogœa) in the treatment of diarrhœa and dysentery.*

Washington, D. C., *August* 31, 1863.

Sir: That pest of the army, diarrhœa or dysentery, can be relieved, in my opinion, in a majority of instances, by letting the person eat a gill or so of peanuts cooked in the ordinary manner. I had an ordinary diarrhœa or dysentery, caused by eating too many vegetables or by the heat, or both together, and after trying laudanum, essence of ginger, and other remedies to no purpose, concluded to eat some peanuts, and after eating a gill the diarrhœa was gone, and another gill actually constipated me. From this I learned that cooked peanuts are an astringent, of which I was not before aware.

In my opinion, if peanuts slightly roasted were placed in our hospitals in small quantities, they would prove the cheapest and best food-remedy for looseness of the bowels that has as yet been tried. If such should prove to be the fact in the hospitals, the peanuts might be issued regularly in the army either as a ration or as a sanitary article of food. Will you please give them a trial?

Very respectfully, your obedient servant,

A. WATSON.

[This letter was referred to Assistant Surgeon A. Hartsuff, in charge of Judiciary Square hospital, Washington, D. C., with directions to secure a sufficient supply of peanuts to test their effects. The following is his report to the Surgeon General:]

Judiciary Square Hospital, Washington, D. C., *September* 29, 1863.

Sir: Agreeably to special orders I have the honor to report that I have used peanuts in several cases of acute and chronic diarrhœa and dysentery and find them to be utterly worthless in either stage of each disease. In one of the four acute cases in which they were used they seemed to produce temporary relief, the alvine discharges diminishing from twelve to three in twenty-four hours; but although the peanuts were continued the diarrhœa became as bad as ever, and other remedies became necessary. In one or two of the chronic cases they seemed to aggravate the disease, and in no case did they produce any permanently good effects.

Very respectfully, your obedient servant.

A. HARTSUFF,
*Assistant Surgeon U. S. Army.*

## *Report on the use of Sub-nitrate of Bismuth in the treatment of diarrhœa, by* Surgeon T. Rush Spencer, U. S. Volunteers.

Second Division Hospital, Alexandria, Virginia, *September* 24, 1863.

Sir: I have the honor to furnish herewith a statement of the results of the treatment of seventy-six cases of diarrhœa with sub-nitrate of bismuth, given in drachm doses, one dose daily.

The number of cases was seventy-six, of which sixty were chronic and sixteen acute. In seventy-one cases the disease was checked, and five still remain under treatment. The duration of treatment necessary to check the disease was one day in twenty-three cases, two days in nine cases, three days in fifteen cases, four days in seven cases, five days in six cases, six days in six cases, seven days in one case, and eight days in four cases.

The impression upon the minds of all the medical officers in this division is very strongly in favor of the bismuth treatment. It has certainly proved the most successful of any hitherto employed, and is worthy of further trial. Dr. Trask has rendered a service to the profession by calling attention to this remedy. I trust this will prove a sufficient explanation for so soon making another special requisition for so large an amount.

Very respectfully, your obedient servant,

T. RUSH SPENCER,
*Surgeon in charge.*

Surgeon R. O. Abbott, U. S. Army, *Medical Director.*

[The foregoing report of Surgeon T. Rush Spencer was referred to in Circular No. 6 (p. 126). November 2, 1868, during a visit to the Museum, Dr. Spencer explained that he did not intend in it to represent the patients as being permanently cured, but simply as having the discharges from the bowels checked for the time being. He also stated that subsequently receiving a supply of the sub-carbonate of bismuth in lieu of the sub-nitrate, he did not find it so efficacious.]

## *Remarks on chronic diarrhœa, by* Surgeon Benjamin Woodward, 22d Illinois Volunteers, *January*, 1864.

In September, 1861, Surgeon James Simons, U. S. A., Medical Director at Cairo, Illinois, directed me to take charge of the depot hospital at that point. There were, as nearly as I can remember, one hundred and sixty-eight patients, most of them suffering from diarrhœa or dysentery. A large proportion had contracted the disease while on duty in the malarious swamps of that region of Illinois and the adjacent parts of Missouri and Kentucky. The appearance of these patients was anæmic and bloodless, with lips and conjunctivæ blanched, muscular tissues wasted, pulse rapid and feeble, tongue, in the recent cases, of a dirty lead color, generally furred at the root, while in those in whom the disease had become chronic it was red or purple, smooth, glossy, and presented a varnished look; it was, however, but rarely dry. The skin was harsh and dry, the urine scanty, limpid, and nearly free from color; dejections frequent, watery, almost destitute of color, and nearly every case complicated with either hemorrhoids or a tendency to prolapsus ani. For some time previously one of two plans of treatment had been employed in the hospital. The first consisted in the administration of astringents, usually dry persulphate of iron in from three to five-grain doses, with from one to three grains of opium, every two or three hours. The other plan was "Surgeon Tripler's saline mode." The diet of all the patients was alike—tea and coffee and toast twice a day, and meat and potatoes for dinner.

The history of nearly every case showed it to have had a malarious origin, while the character of the dejections and other symptoms proved that there was hepatic derangement. Generally the liver was torpid, there being little or no bile in the fæces. A very large number of cases complained of a sense of fulness in the abdomen, particularly in the region of the liver. On endeavoring to analyze and classify these cases, the evidence was conclusive to my view that in the latter group of cases, though the abdomen was flaccid, there was congestion of the liver and portal circulation, and I selected these for a full trial of Tripler's treatment, and ordered an ounce of sulphate of magnesia, a grain of tartar emetic, and four ounces of water. Of this mixture one-fourth was given every two hours, and as soon as the bowels were moved (and scybala were generally brought away in large quantities) gave four powders, consisting each of five grains of quinine, half a grain of ipecacuanha, and one of opium—one to be taken every three hours; or, when the liver was more than usually torpid, substitute for these four powders, consisting each of five grains of quinine, three of mercury with chalk, and half a grain of opium—one to be taken every four hours. As soon as the salines had operated well, there was generally relief from the sense of fulness and oppression in the portal region. I did not repeat the salines unless this sense of oppression returned, which was rarely the case, but relied on an after-treatment with quinine, ginger, and stimulants, and as generous a diet as the stomach would bear.

In the other class of cases I relied on quinine, gallic acid, when I could get it, and when I could not, tannic acid, and mercury with chalk. My experience with opium in camp diarrhœa has not been satisfactory, unless the liver was too active, when it moderated that action. In old chronic cases, when the tongue had become smooth and glossy, iron by hydrogen, with the bitter tonics, have fully answered my expectations. I made many examinations of the bodies of those who died from camp diarrhœa, and in every case in which the tongue had assumed the varnished appearance above alluded to the whole intestinal canal was more or less diseased, and the patients died of starvation, digestion being impossible. The blood in these cases was like what I have seen in Asiatic cholera. The mucous coat of the intestines was blanched, in many cases abraded or ulcerated, the solitary glands invariably enlarged, while the mesenteric glands were enlarged and softened.

I beg leave here to call attention to a form of diarrhœa which has been very common at the hospital at Tullahoma, Tennessee, during the fall of 1863. When the Eleventh and Twelfth Army Corps came from the army of the Potomac to join the army of the Cumberland, they left a large number of sick at this hospital. Many of these were cases of diarrhœa. To the practiced eye it was not difficult to detect scorbutus. There were frequent dejections, wandering pains in the muscles of the limbs, particularly those of the thighs and legs, lumbago, lassitude, and in many cases sponginess of the gums, and spots of purpura. These men had for a long time been without vegetables and the blood had become depraved. Having served in the army of General Pope in the spring of 1862, in the operations before New Madrid, Missouri, and Island No. 10, while the blockade of the Mississippi river existed, I had many opportunities of seeing this form of diarrhœa, the troops for many weeks being confined to a diet of bacon, hard bread, and coffee. Every known means of medication was resorted to, including the potash treatment, but it all proved nugatory, and it was not until vegetation commenced and the men could gather a few greens that any amendment took place. When the Eleventh and Twelfth Corps came here with this form of diarrhœa no form of medication was resorted to, but they were given all the vegetables and fruits they could eat. Every case recovered. It was found that when the vegetables were given to them in the raw state the effect was more marked. Potatoes, onions, and tomatoes sliced in vinegar were the most grateful and efficacious. After the battles of Lookout Mountain and Missionary Ridge, in November last, ninety-six wounded were brought from the front to this hospital. Many of them had scorbutic diarrhœa. In no case were medicines administered for it, but a fresh vegetable and fresh meat diet was relied upon, and it was remarkable to see how soon not only the diarrhœa abated, but the wounds took on healthy action.

## *Extract from the report of the inspection of the general hospital at Chattanooga, Tennessee, by* Medical Inspector Edward P. Vollum, U. S. A., *January* 15, 1864.

The want of success attending the great variety of medical treatment that has been tried in chronic diarrhœa, and its high rate of mortality, has very generally discouraged the surgeons in the employment of medicines of any kind except by enema. Consequently, attention is directed in the Department of the Cumberland to the value of dietetic measures, and I learn that more success has been obtained than ever before, in the management of chronic diarrhœa especially. At Division No. 2, Surgeon C. N. Ellinwood, 74th Illinois volunteers, claims excellent success in this obstinate complaint by the employment of well-

prepared digestible food, with enemas of nitrate of silver, two grains to the ounce. This treatment is particularly applicable in those cases where the rectum has become thickened, ulcerated, eroded, &c., as manifested by the foul, mucous, dark stools, often containing patches of membrane. Dr. Ellinwood employs a conserve of beef made by mixing the finely grated fibre of muscle with currant or gooseberry jelly, said to be more palatable and digestible than beef-tea. From two to twelve ounces of this are given daily. The ordinary beef-tea, made fresh three times per day, is also employed. Before the enema is given the rectum is washed out with tepid water. The enemas are continued twice a day till the stools cease to be bloody. Where there is not much evidence of organic change in the intestines and the stools were acid, mercury with chalk, and ipecacuanha are often employed with benefit. Opium is sometimes added to allay tenesmus.

Surgeon John L. Teed, U. S. volunteers, at Division No. 4, also employs the dietetic method in chronic diarrhœa with benefit. He has separated such cases under the charge of one surgeon, who is directed to make careful observations and records of his cases.

I have striven assiduously to inculcate the advantage of digestible and palatable food in chronic diarrhœa over any plan of medication, and it is gratifying to see that others have arrived at the same conclusion, having set to work earnestly at it from their own promptings.

## *Report on the use of Bromine in cases of chronic diarrhœa and dysentery, treated in prison hospital, Rock Island, Illinois, by* Acting Assistant Surgeon H. F. Gilbert, *November 14, 1864.*

* * * September 5, 1864, I organized a ward capable of accommodating forty-three patients, and up to the 20th of October ninety have been admitted; forty-seven were cases of chronic diarrhœa, thirty-one of acute dysentery, and twelve acute diarrhœa.

*Treatment.*—℞. Bromine six drops, bromide of potassium fifteen grains, water one ounce. I administered one drachm of this solution every two hours during the day, without regard to stage, complications, character of discharges, or constitutional symptoms, with the following results: Returned to barracks cured, seventy-nine; remaining in ward, ten; died, one. Those remaining are suffering from chronic diarrhœa complicated with scurvy, very much emaciated, and will not be fit for duty within sixty days. All such are ordered south for exchange. I am of the opinion that they would finally recover were they kept on the bromine treatment.

The *post mortem* made on the body of the case resulting in death shows its complications, and the difficulty of treating such cases is apparent to the most casual observer. [Case 78, *Infra.*] Private William Baily, company B, 2d Kentucky cavalry, transferred to my ward October 11, 1864, died October 19th. *Autopsy* thirty-six hours after death: Body greatly emaciated. There were strong pleuritic adhesions on both sides. Miliary tubercles were numerously scattered through both lungs, most abundantly at their apices; the parenchyma between the tubercles was indurated by pneumonia, and of a gray color from pigmentary deposit. The heart was very large and fatty. The liver was enlarged and greatly altered in shape; it was of a dusky color, and on section presented semi-translocent edges. The stomach was ulcerated to some extent. The small intestines were œdematous, and their coats generally thickened. About the middle third of the jejunum there was an intussusception of about two inches in length; immediately above and below, two lumbricoid worms were found, the smaller above and the larger below. About the invagination the gut was greatly congested. The mucous membrane of the large intestine was extensively ulcerated, thickened, and disorganized. The other organs were healthy.

I found the acute cases, both of diarrhœa and dysentery, recovered with greater rapidity than the chronic. The progress of the latter, in my opinion, was retarded in a great measure by the too frequent use or administration of the remedy; for in the extremely emaciated cases the medicine would cause a slight sickness of the stomach, thereby preventing the patient from taking the amount of nourishment necessary to sustain life; but when administered at long intervals no such symptoms occurred, the digestion improved, griping and tenesmus subsided, and the discharges gradually became more natural, until the patient was entirely restored to health.

It is proper to state that the chronic diarrhœa cases were the worst that could be selected from the hospital; most of them were of over twelve months' standing. The patients were greatly emaciated; the tongue dry; and the contents of the bowels passed off, as they lay in bed, without intermission.

In those cases complicated with chronic inflammation of the lungs and lining membrane of the bronchial tubes, and even when the lung was dense, solid, and impervious to air in some parts, (which is more or less the condition of extremely emaciated diarrhœa subjects,) I found the pains in the chest and dyspnœa, together with the troublesome cough, entirely disappear in a very short time, and the patient expressing himself as "feeling like a new man."

Whether the bromine acted directly upon the diseased pulmonary tissue by inhalation, or in some other way, remains to be ascertained. As it is wonderfully volatile I am inclined to the opinion that its good results are due to the direct application of the vapor to the tissue involved—a method in the treatment of chest diseases which, I confess, I am surprised at the profession viewing with so much indifference. Be this right or wrong, certain it is, I have been astonished at the happy results in such cases as the above treated with bromine.

Bromine is a new remedy, its status as yet remaining unknown or unsettled, and we have but imperfect data from which to draw our conclusions. Still, I am impelled from personal observations and experience to assert that in bromine we have an agent certain in its effects to cure all cases of diarrhœa or dysentery, I care not of how long standing, if the patient has sufficient vitality left to sustain life five or six days; and a perfect restoration to health may be relied upon, unless the disease is complicated with some serious malady.

I am aware that this is a sweeping assertion, yet I doubt not that the time is not far distant when the medical profession will verify what I am now saying. I herewith append a note from Dr. Salter, who has been using bromine in the barracks:

ROCK ISLAND, ILLINOIS, *October* 14, 1864.

Dr. H. F. GILBERT.

DEAR SIR: Since I had the pleasure of listening to your remarks on the use of bromine in dysentery and diarrhœa I have been testing for myself the efficacy of that medicine in the two diseases above mentioned. I have been prescribing it in the prison barracks, where the situation and attending circumstances are by no means favorable for the administration of any remedy, and least of all in diarrhœa and dysentery; notwithstanding, I have found it in many instances of the above complaints to have answered a most excellent purpose, and I believe it to be a very valuable remedy. I do not think that I ever tried any one article of the *materia medica* which has proved so satisfactory under all circumstances. There have been several cases apparently not benefited by its administration, thus proving that it is not a specific; yet I cannot say that, under more favorable circumstances, it might not have been more satisfactory even in these cases, and I would here remark, also, that these cases had not been relieved by any previous course of treatment. I would say, in conclusion, that in the treatment of these two diseases I have found in bromine a most valuable remedy, and that in many very severe cases I have been both surprised and pleased with its efficacy, and deem it well worthy the attention of the profession. Hoping that the fullest success may attend you in your efforts to ascertain the full force of bromine and its applicability to the various diseases now being treated by you,

I am, sir, with much respect, yours truly, &c.,

H. F. SALTER,
*Acting Assistant Surgeon U. S. Army.*

In conclusion, I would say that the medical descriptive lists of the above cases have been carefully kept, and in due time they will be published, that the medical profession may judge of the character of the cases treated, and of the power of bromine in effecting astonishing cures.

[The foregoing report was indorsed as follows:

*November* 14, 1864.

Respectfully forwarded, and commended to the notice of the Medical Director.

WILLIAM WATSON,
*Surgeon U. S. Volunteers, in charge.*

December 29, 1865, Surgeon Watson, during a visit to the Surgeon General's Office, informed the editor that more extended experience in the hospital at Rock Island did not fulfil the sanguine expectations entertained by Dr. Gilbert.]

## *Cases of diarrhœa and dysentery treated with Bromine during* 1864, *at Rock Island prison hospital.*

[The case-book of the Rock Island prison hospital contains Dr. H. F. Gilbert's reports of fifty-seven cases of diarrhœa and dysentery supposed to have been cured by the use of bromine, as described in the last report. These are appended, together with such cases of the same disease which proved fatal under the bromine treatment, as are recorded in the book.

The following table shows the number of prisoners of war confined at Rock Island, and the number of admissions into hospital, and deaths from diarrhœa and dysentery monthly, from August, 1864, to January, 1865, inclusive; this being the period during which Dr. Gilbert's cases occurred:

| MONTH. | 1864. | | | | | | | | | | 1865. | | TOTAL. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | August. | | September. | | October. | | November. | | December. | | January. | | | |
| Mean Strength | 8,361 | | 8,236 | | 7,924 | | 6,974 | | 6,461 | | 6,419 | | | |
| | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. |
| Acute Diarrhœa | 125 | ..... | 58 | 2 | 38 | ..... | 95 | 2 | 286 | 4 | 102 | 2 | 704 | 10 |
| Chronic Diarrhœa | 62 | 28 | 66 | 8 | 39 | 8 | 61 | 8 | 72 | 23 | 42 | 27 | 342 | 102 |
| Acute Dysentery | 897 | 25 | 396 | 14 | 56 | 1 | 60 | ..... | 110 | 2 | 24 | ..... | 1,543 | 42 |
| Chronic Dysentery | 5 | 1 | 25 | 1 | 5 | 2 | 2 | ..... | 2 | ..... | 1 | 1 | 40 | 5 |
| Total | 1,089 | 54 | 545 | 25 | 138 | 11 | 218 | 10 | 470 | 29 | 169 | 30 | 2,629 | 159 |

The extent to which the bromine treatment was used during this period does not appear in the report. Dr. Gilbert's cases are the only successful ones recorded.

In some of the cases Dr. Gilbert substituted a weak solution of iodine; two grains of iodine dissolved in an ounce of water by means of iodide of potassium. The dose was ten drops three times a day. The reason alleged for the change in the case of McDaniel, case 80, was the temporary exhaustion of the supply of bromine.

An examination of these cases shows that Dr. Gilbert's enthusiastic hopes are not supported by the record. Of the fifty-seven cases reported by him in the case-book as cured, eleven were shortly after readmitted with the same disease; two others were dead at the time Dr. Gilbert dates his report, (case 44, Pitts, died October 30th, and case 59, Meigs, November 2d;) and two more died subsequently, (case 56, Whitehead, December 13th, and case 51, Murray, January 18, 1865.)

Besides these fatal cases, the case-book contains reports by Dr. Gilbert himself of four other fatal cases, three of whom were dead at the date of his report, (case 76, Jones, October 1st; case 77, Nelson, October 2d; and case 80, McDaniel, November

4th;) so that if Dr. Gilbert had examined the record instead of merely trusting to his memory, as he appears to have done, his report should have contained six fatal cases instead of one. The case-book also contains the records of eleven other fatal cases treated with bromine; six of these were recorded by Dr. Salter, whose letter is contained in Dr. Gilbert's report; four by Dr. Young, and one by Dr. Mathews. It appears by the record that four of these cases (case 81, Green; case 82, Gillium; case 83, Fisher; and case 87, Burke) had been treated by Dr. Gilbert with bromine.]

## *Cases reported by* Dr. Gilbert *as cured.*

Case 19.—Private Matthew N. Goss, company B, 8th Georgia battery; age 28; admitted June 16, 1864. Chronic diarrhœa of eighteen months' standing. Was first seen by the reporter September 9th. September 14th: Ordered a drachm of solution of bromine every four hours. September 16th: The same every two hours. September 23d: The operations are not so frequent, but they are still thin, watery, and light colored. October 24th: Returned to the barracks cured.

Case 20.—Private John McLaughlin, company C, 18th Alabama; admitted August 10, 1864. Acute dysentery. The operations were very small, bloody, and frequent. There is no record of his treatment until September 16th, when he was put upon solution of bromine. He immediately began to improve, and was discharged, cured, September 26th. [According to the hospital register this man was again admitted with diarrhœa November 7th, and returned to the barracks January 3, 1865.]

Case 21.—Private James R. Robinson, company F, 33d Georgia; age 32; admitted August 13, 1864. Chronic diarrhœa of twelve months' standing. The patient was treated with astringent pills, pills of acetate of lead and opium, pills of quinine, opium, and capsicum, tincture of the chloride of iron, &c., until September 14th, when he was put upon the use of solution of bromine. September 20th: Has improved rapidly. But two stools in the last twenty-four hours; these, though thin, are natural in color. September 22d: Continues to improve. September 28th: Returned to barracks cured.

Case 22.—Sergeant John W. English, company A, 52d Georgia; age 20; admitted August 14, 1864. Acute dysentery. Had been sick about twelve days. The stools were very frequent, painful, and chiefly composed of blood. The patient was treated with astringent pills, pills of quinine, capsicum and opium, pills of nitrate of silver and opium, &c., until September 14th, when solution of bromine was prescribed. September 22d: Has improved somewhat. The stools are less frequent, not so painful, and contain no blood, but are still small. The soreness of the abdomen is diminishing. October 9th: Continues to improve slowly. The passages are more natural, but still frequent. October 21st: Substituted ten drops of solution of iodine, two grains to the ounce, three times a day. November 6th: Returned to the barracks cured. [According to the hospital register this man was returned to the barracks November 22d.]

Case 23.—Private Phineas Wilds, company A, 3d Florida; age 33; admitted August 14, 1864. Chronic diarrhœa. The patient stated that he had suffered from diarrhœa at intervals for the last fourteen months. At the time of admission he had from eight to ten rather large, thin, watery, light-colored passages daily. He was treated with astringent pills, pills of nitrate of silver and opium, &c., without benefit. September 13th: He was put upon the solution of bromine. September 20th: Has improved rapidly; has now but one or two passages daily, and these are quite natural in appearance. September 26th: Returned to the barracks cured. [According to the hospital register this man was readmitted, with the same disease, October 27th, and returned to the barracks November 28th. He was again admitted, also for the same disease, December 11th, and returned to the barracks March 4, 1865.]

Case 24.—Private William W. Williams, company I, 31st Alabama; admitted August 17, 1864. Acute dysentery. This man had been sick five days when admitted. He had from twelve to fifteen small, bloody passages in the twenty-four hours. He was treated with astringent pills, nitrate of silver and opium, sulphate of magnesia, aromatic sulphuric acid, &c., without benefit. September 16th: A drachm of bromine solution was ordered every two hours. September 20th and 21st: Rest without medicine. September 22d: Five grains of blue pill. September 24th: Resumed the bromine mixture. September 26th: Returned to the barracks cured.

Case 25.—Sergeant J. D. Drummond, company D, 34th Georgia; admitted August 20, 1864. Chronic diarrhœa of four months' standing. Has six to eight thin, watery stools daily. Has been under medical treatment most of the time. After his admission to hospital, was treated with pills of nitrate of silver and opium, &c., but without benefit. September 14th: Was put upon a drachm of the solution of bromine every two hours. He improved rapidly, and September 28th was returned to the barracks cured. [According to the hospital register this man was readmitted, with diarrhœa, October 17th, and returned to the barracks November 4th.]

Case 26.—Private Albert Jenkins, company A, 40th Alabama; age 26; admitted August 20, 1864. Chronic diarrhœa of ten months' standing. The complaint was first developed immediately after a fatiguing march; has been under medical treatment ever since, but without permanent benefit. After his admission to hospital he was treated with astringent pills, brandy, &c. Was first seen by the reporter September 16th. At that time he had from six to eight thin, watery operations in the twenty-four hours. Some of the stools resembled the white of an egg. To take a drachm of solution of bromine every hour. September 24th: Has improved rapidly; the stools are less frequent and more natural; he had but three in the last twenty four hours. October 9th: Has continued to improve since the last report. The bowels are now regular. Returned to barracks, cured, October 24th. [According to the hospital register this man was readmitted, with diarrhœa, October 28th, and was returned to the barracks March 17, 1865.]

Case 27.—Private John R. Combs, company D, 4th Florida; age 20; admitted August 25, 1864. Chronic diarrhœa of thirteen months' standing. Has been under medical treatment most of the time. When admitted he had from eight to ten stools daily, and when first seen by the reporter, September 16th, was in the same condition. The solution of bromine was then

prescribed, and the patient immediately began to improve. September 30th: Has continued to improve. Is now on full diet. October 22d: Bowels tolerably regular and stools quite natural. Discontinue medicine. November 6th: To take ten drops of the iodine solution, two grains to the ounce, three times daily. November 20th: Resume the solution of bromine. December 29th: Is quite well, and is detailed as a nurse.

CASE 28.—Private Jackson Brantly, company E, 18th Arkansas; age 32; admitted August 25, 1864. Diarrhœa of two months' duration. Had from eight to ten operations daily. Was treated with pills of nitrate of silver and opium, pills of quinine, capsicum, and opium, &c. Was first put upon the bromine solution September 12th; at that time he had one or two operations every hour, and the stools were often passed in bed. September 22d: Has improved very rapidly. Had but two operations in the last twenty-four hours. October 9th: Has continued to improve since the last note; has been four or five days on full diet; bowels regular, passages natural. October 24th: Returned to the barracks cured.

CASE 29.—Private George W. Bond, company A, 1st Tennessee battery; age 32; admitted August 27, 1864. Chronic diarrhœa of seven months' standing. Had from eight to ten thin, watery operations daily. Was treated with pills of nitrate of silver and opium, &c., until September 14th, when a drachm of the bromine solution was ordered to be taken every four hours. October 22d: Substituted ten drops of iodine solution, two grains to the ounce, three times daily. November 14th: Resumed the solution of bromine. November 20th: Discontinued medicine. November 22d: Returned to the barracks.

CASE 30.—Private William Lawler, 10th Confederate cavalry; age 21; admitted August 28, 1864. Chronic diarrhœa of eight months' standing. The stools averaged five daily, and consisted, according to the patient, of a "mushy" substance. There is no record of his treatment in hospital until September 16th, when solution of bromine was prescribed. He then improved rapidly, and was discharged, cured, October 9th. [According to the hospital register this man was returned to the barracks December 25th.]

CASE 31.—Private Thomas A. Scott, company K, 43d Tennessee; age 24; admitted September 4, 1864. Chronic diarrhœa of six months' standing. Has from five to eight passages daily; they are thin, watery, and very light colored. There is no record of his treatment until September 16th, when solution of bromine was prescribed. September 20th: Had but two operations in the past twenty-four hours; they are still unchanged in character. September 26th: Is much better. To have full diet. September 28th: Discharged cured.

CASE 32.—Private Joseph Chitwood, company H, 1st Georgia; admitted September 5, 1864. Acute diarrhœa. Had from eight to ten thin, watery operations in the twenty-four hours. Is very much emaciated. Was put on the use of bromine September 16th. There is no record of his previous treatment. September 22d: The patient has improved rapidly. The stools are less frequent and more natural. September 25th: Has continued to improve. The operations are now quite natural. Has been on full diet for three days. Discharged cured. [According to the hospital register this man was readmitted, with diarrhœa, October 27th, and returned to the barracks December 3d.]

CASE 33.—Private Jesse G. Ingram, company G, 48th Tennessee; admitted September 6, 1864. Acute dysentery. Had ten to twelve small, painful, bloody stools daily. Up to the 16th of September the patient did not improve. He was then put on solution of bromine. September 20th: Has improved quite rapidly; the stools are natural in appearance. September 26th: Returned to the barracks cured.

CASE 34.—Private Richard Forrest, company I, 9th Louisiana cavalry; age 25; admitted September 9, 1864. Chronic diarrhœa of five months' standing. At the time of admission he had from twelve to fifteen operations daily. The stools were light colored, thin, and watery. Was placed at once on solution of bromine. September 21st: Improved rapidly on the bromine. Had but two operations in the last twenty-four hours, and these were more natural in appearance than any he has had for months. October 9th: Continues to improve. Has scorbutic sore mouth, which should have been previously mentioned. November 5th: To take twenty drops of tincture of the chloride of iron three times daily, and to use a mouth-wash of two grains and a half of sulphate of zinc to the ounce of water. December 8th: Returned to the barracks well.

CASE 35.—Private D. K. McClinton, company C, 3d Alabama; admitted September 9, 1864. Acute dysentery. Had from eight to twelve small, bloody operations daily, accompanied by much pain. ℞. Sulphate of magnesia two drachms, opium five grains; make five powders; take one every four hours. September 12th, rest. September 13th: Repeat the prescription of the 9th. September 14th to 16th, rest. September 17th: To take solution of bromine. September 19th: Discharged cured.

CASE 36.—Private Thomas Pugh, company G, 36th Alabama; age 20; admitted September 11, 1864. Chronic diarrhœa of six months' standing. The patient has been under medical treatment most of the time, but without benefit. When admitted he had from eight to ten thin, watery, light-colored operations daily; sometimes they were streaked with blood. This man was put on the bromine treatment September 16th. September 30th: He has improved very much; the stools are more natural and less frequent. October 9th: The bowels are regular and the stools quite natural; has been on full diet several days. October 24th: Returned to the barracks cured. [According to the hospital register this man was readmitted with the same disease November 2d, and returned to the barracks November 23d.]

CASE 37.—Joseph Hammil, a conscript; admitted September 13, 1864. Acute dysentery. The stools were small, very frequent, and painful; they were chiefly composed of blood. The patient improved rapidly, and was discharged, cured, September 13th. [According to the hospital register this man was returned to the barracks September 26th.]

CASE 38.—Corporal James L. Hallsop, company L, 41st Mississippi; age 34; admitted September 13, 1864. Acute dysentery. First seen by the reporter September 24th. He had been sick five days. When first admitted had two or three stools

hourly; they were very small, painful, and chiefly composed of blood. October 1st: Is much better; has about five operations daily, but they are not painful, and contain no blood. October 9th: Discharged cured.

CASE 39.—Private John W. Basford, company I, 4th Florida; admitted September 13, 1864. Acute dysentery. The stools were small, bloody, and frequent. To take a drachm of bromine solution every two hours. The patient improved rapidly; was put on a full diet September 25th, and returned to the barracks, cured, October 1st.

CASE 40.—Private Washington H. Franklin, company H, 16th Georgia; admitted September 14, 1864. Acute diarrhœa. The patient had from eight to ten thin, watery passages daily, which were accompanied by some pain. Treatment, a drachm of solution of bromine every two hours. Returned to the barracks, cured, September 19th.

CASE 41.—Private Thomas O'Neil, company G, 2d Arkansas cavalry; age 19; admitted September 14, 1864. Diarrhœa of five months' standing. Has been under medical treatment most of the time, but without relief. Has now daily from six to eight small, painful stools mixed with blood. Treatment, a drachm of bromine solution every hour. September 23d: Is very much improved. Had but two stools in the last twenty-four hours, and these were quite natural in appearance and unaccompanied by pain. Is still weak and emaciated. October 9th: Since the last report the patient has improved very much; his bowels are regular and the stools natural. Is on full diet. October 24th: Returned to the barracks cured. [According to the hospital register this man was readmitted with diarrhœa November 1st, and returned to the barracks November 26th.]

CASE 42.—Private Francis Hopewell, company B, 1st Kentucky; admitted September 14, 1864. Diarrhœa of nearly three months' standing. Has from six to eight operations in the twenty-four hours. To take a drachm of solution of bromine every two hours. October 9th: Is very much better; the stools are quite natural in appearance. October 22d: Substituted ten drops of solution of iodine, two grains to the ounce, three times a day. November 1st and 2d, rest. November 3d to 14th, solution of iodine as before. November 15th, solution of bromine. November 20th, half an ounce of castor oil. November 21st, resume the bromine. December 1st, add a pint of milk-punch daily. December 6th: Transferred to the convalescent ward. Returned to the barracks December 11th.

CASE 43.—Private William A. Simmonton, company E, 8th Virginia cavalry; age 21; admitted September 17, 1864. Acute dysentery. Says he was sick fourteen days before admission. Has one or two very small, painful, bloody stools every hour. Treatment, solution of bromine. September 22d: Had but one operation in the last twenty-four hours; the passage was small and composed of mucus. Has had no natural evacuation as yet. After this date, however, the patient improved rapidly, and was discharged, cured, September 30th.

CASE 44.—Private Eli B. Pitts, company C, 18th Alabama; age 42; admitted September 18, 1864. Chronic diarrhœa of six months' duration. Has, on an average, six thin, watery operations daily; sometimes the stools contain blood. Treatment, solution of bromine. September 20th: Is improving; had only three operations in the last twenty-four hours; these were light colored, contained no blood, and were accompanied by very little pain. October 9th: Discharged, cured. [According to the hospital register this man was readmitted October 25th with the same disease, and died October 30th. No autopsy.]

CASE 45.—Private Samuel Yates, company C, 28th Tennessee; admitted September 19, 1864. Acute dysentery. Had been sick with dysentery five days when admitted. Had previously suffered with scurvy, and is very much emaciated; stools very frequent. Treatment, solution of bromine. September 30th: The patient has improved rapidly since the last note. His bowels are now regular and the operations nearly natural in character. October 9th: The scorbutic symptoms have almost disappeared; the passages from the bowels are quite natural in appearance and frequency. October 18th: Returned to the barracks cured. [According to the hospital register this man was readmitted with diarrhœa October 24th, and was returned to the barracks May 26, 1865.]

CASE 46.—Private Edward Lesser, company A, 11th Arkansas cavalry; age 21; admitted September 19, 1864. Chronic diarrhœa. This man was attacked with measles May 1, 1864; diarrhœa set in during the attack and has continued ever since. The patient also had a cough, with pain in the left side of the chest, and rather scanty mucous expectoration. In July he had pneumonia of the left lung, and in September an attack of erysipelas of the face. He was treated with a drachm of bromine solution every four hours until October 24th. From November 1st to 5th he had ten drops of iodine solution, two grains to the ounce, three times daily. From November 6th to 12th, kept at rest without medicine. November 14th: The bromine mixture was resumed, and November 18th, cod-liver oil and whiskey were added. November 28th: Returned to the barracks cured.

CASE 47.—Private Alfred A. Farr, company D, 7th Mississippi; admitted September 20, 1864. Acute dysentery. The patient was very weak, and had small, bloody stools almost every hour. Treatment, solution of bromine. September 30th: Is very much better; has now but two or three stools daily, and they are quite natural in appearance. Is on full diet. October 22d: Substituted for the bromine ten drops of solution of iodine, two grains to the ounce, three times daily. November 28th: Returned to the barracks cured.

CASE 48.—Private Nathan Elliott, company D, 45th Tennessee; admitted September 21, 1864. Acute dysentery. Had one or two small, bloody passages every hour, accompanied by much pain. Treatment, solution of bromine. The patient improved rapidly, and was discharged, cured, October 7th. He had been on full diet several days before he was discharged.

CASE 49.—Private William A. Steele, 20th Tennessee; admitted September 21, 1864. Acute dysentery. Had from twelve to fifteen very small, bloody stools in the twenty-four hours. Treatment, a drachm of solution of bromine every two hours. The patient improved rapidly, and was returned to the barracks, cured, September 26th.

CASE 50.—Private Cincinnatus Livingston, company E, 34th Alabama; age 22; sober; admitted September 21, 1864. Chronic diarrhœa of a year's standing. The discharges are frequent but not very painful. The patient has had spasms,

followed by periods of mental aberration. September 26th: Ordered a drachm of the bromine solution every hour. September 30th: The patient is improving slowly; his countenance has a silly expression. October 10th: The passages average twelve to fourteen daily; they are thin but not painful. The patient suffers with sick stomach; his appetite is not good. October 22d: Bowels still loose. November 12th: Returned to the barracks cured. [According to the hospital register this man was not returned to the barracks till December 25th.]

CASE 51.—Sergeant William Murray, company A, 64th North Carolina; aged 30; sober; admitted September 21, 1864. Chronic diarrhœa of a year's standing. September 26th: Bromine solution was prescribed, under the influence of which the passages became less frequent, but continued painful. September 30th: Complains of dysuria. To take a teaspoonful of fluid extract of buchu three times daily. October 30th: Passages average eleven daily, are bloody and slimy, at times painful. Has not improved as yet. Complains of pain in the small of the back and left side. Appetite not very good. November 12th: Returned to the barracks cured. [According to the hospital register this man died of chronic diarrhœa January 18, 1865.]

CASE 52.—Private John Adams, company C, 53d Georgia; age 32; admitted September 22, 1864. Chronic diarrhœa of six months' standing. The patient had been under medical treatment most of the time. On the 15th of September an acute attack of dysentery supervened. When admitted he was very much emaciated, and had small, bloody stools every hour. Treatment, bromine solution. October 1st: Has improved very much. The stools are less frequent, more natural, and contain no blood. The patient subsequently continued to improve; slowly gained strength; his bowels continued regular, and he was transferred to the convalescent ward December 13th. [Returned to the barracks December 25th.]

CASE 53.—Private Benjamin M. Day, company K, 31st Alabama; aged 20; admitted September 23, 1864. Acute dysentery. Had been sick three weeks. Stools from six to eight daily; they were small, very painful, and mixed with blood, some of them were composed entirely of blood. Treatment, solution of bromine. October 1st: Has improved rapidly; is now on full diet. October 30th: Discharged cured.

CASE 54.—Private Henry Branch, company E, 1st Alabama cavalry; age 24; sober; admitted September 23, 1864. Chronic diarrhœa of several years' standing. His last attack was in July. September 26th: Bromine solution was prescribed, under the use of which the passages became less frequent, but continued to have a mucous character, and were very painful. September 30th: Is improving slowly. October 10th: The passages average one a day and are natural in character. The patient says he feels better than he has done for the last three months, but has a cough which troubles him somewhat. October 15th: Returned to the barracks quite well.

CASE 55.—Private William I. Taylor, company B, 24th Mississippi; age 35; sober; admitted September 24, 1864. Chronic diarrhœa of two years' standing. The passages were slimy and averaged one an hour. He was treated with a drachm of the bromine solution every hour. September 30th: Doing very well. October 10th: The passages are painful, and average six to the twenty-four hours; still the patient considers himself better than when admitted. October 22d: Bowels better, but has a troublesome cough. November 3d: Discharged cured. [According to the hospital register this man was readmitted with diarrhœa December 6th, and remained in hospital until he was exchanged, February 15, 1865.]

CASE 56.—Private Philip Whitehead, Foster's Alabama battery; age 21; sober; admitted September 24, 1864. Chronic diarrhœa of eight months' standing. The stools were bloody and slimy. To take a teaspoonful of bromine solution every hour. September 30th: Is improving slowly. October 10th: The passages still average ten daily, are very painful, and contain blood and slime. The patient has a cold, and complains of sick stomach every morning. October 22d: Bowels better, some colicky pains. October 30th: Returned to the barracks well. [According to the hospital register this man died of chronic dysentery December 13th.]

CASE 57.—Private John Stevens, company I, 24th Tennessee; admitted September 24, 1864. Chronic dirrrhœa of nearly a year's standing; also suffering from a cold in the chest. To take a drachm of solution of bromine every hour. There was at first no alteration in the number of passages, which continued painful and unnatural; but the bromine was thought by the patient to relieve his chest symptoms. September 30th: Feels better; is now on half diet. Discharged, cured, October 10th

CASE 58.—Private N. Manly, company B, 2d battalion Missouri cavalry; age 21; of dissipated habits; admitted September 24, 1864. Chronic diarrhœa of two years' standing. The last attack commenced in the early part of August. The patient is weak, has no appetite, and is also suffering from a bronchial affection. To take a drachm of the bromine solution every hour. October 10th: The passages are less frequent, rarely painful; they average seven or eight daily. The stools are viscous, but improved in appearance. The patient suffers from intense headache, is very restless at night, complains of a nauseous taste and odor of phlegm. The cramps in the stomach have disappeared, but he has pain in the right side and spine, dull pain and a sense of oppression in the chest. October 22d: The bowels are still loose, but the general health is better. October 25th: Discharged cured. [According to the hospital register this man was not returned to the barracks until November 2d.]

CASE 59.—Private James Meigs, company I, 2d Georgia cavalry; age 29; sober; admitted September 26, 1864. Chronic diarrhœa and bronchitis, from which he has suffered since last June. Under the bromine treatment the stools became less frequent and less painful, but the pains in the chest more severe. September 30th: Is very weak. October 10th: The stools are more natural, not so painful, and average three a day. The cough is quite troublesome; the patient expectorates a good deal, is restless at night, and complains of pain in his chest and stomach. October 22d: The diarrhœa is worse; the mouth presents signs of scurvy, the sputa contain blood. November 12th: Returned to the barracks cured. [According to the hospital register this man died of diarrhœa November 2d.]

CASE 60.—Private Pleasant D. Phillips, company I, 3d Confederate cavalry; age 18; temperate; admitted September 26, 1861. Chronic diarrhœa of six months' standing. The passages are thin, painful, and average eight to the twenty-four

hours. Treatment, a drachm of bromine solution every hour. October 22d: Bowels better; the patient has a severe cough. November 1st: Discharged cured. [According to the hospital register this man was readmitted with diarrhœa November 20th, and remained in hospital until he was exchanged, March 12, 1865.]

CASE 61.—Private Jesse Roberts, company I, 1st Georgia cavalry; admitted September 26, 1864. Chronic diarrhœa. This man was also suffering from a wound in the head. He had frequent and painful passages from the bowels, but his appetite was good. Under the bromine treatment the diarrhœa rapidly subsided, and, October 5th he was discharged perfectly well, so far as his bowels were concerned; his head, however, still troubled him.

CASE 62.—Private R. Nelson, company C, 27th Mississippi; a man of rather intemperate habits; admitted September 26, 1864. Chronic diarrhœa of two years' standing. The stools were bloody, slimy, and averaged one an hour. The patient is also troubled somewhat with piles. Appetite good. To take a drachm of solution of bromine every hour. September 30th: Is better; half diet. Discharged, cured, October 5th.

CASE 63.—Private E. L. Smith, company F, 4th Alabama cavalry; age 36; sober; admitted September 27, 1864. Chronic diarrhœa of a year's standing. Last attack in the spring of the present year. Stools thin and frequent. Treated with the bromine solution. October 10th: The passages average six daily; they are thin, light-colored, at times mixed with mucus, and about as painful as when he was first admitted. He complains of pain in the lower extremities. October 22d: Is better. November 12th: Returned to the barracks cured. [According to the hospital register this man was not returned to the barracks till January 1, 1865.]

CASE 64.—Private Miles J. Covington, Allison's battery; age 37; sober; admitted September 27, 1864. Chronic diarrhœa of two years' standing. His last attack was seven months ago. The passages are frequent and painful. Treatment, solution of bromine. October 10th: The passages average six in the twenty-four hours; they are less painful than when admitted. He considers himself improving. Complains of a constant pain in the small of the back. October 22d: Bowels better. November 3d: Returned to the barracks cured.

CASE 65.—Private William C. Dodson, company D, 51st Alabama; age 18; admitted September 28, 1864. Chronic diarrhœa. This man had small-pox last February, and while convalescing diarrhœa set in, accompanied by cough, with free muco-purulent expectoration, and pain in the right side of the chest during full inspiration. The diarrhœa was soon checked, but returned about a month later, and persisted. The bronchial symptoms also continued to grow worse, and when admitted the patient had profuse night-sweats. The patient was treated with the bromine solution until October 30th, when the following was substituted: ℞. Iodine two grains, iodide of potassium a sufficient quantity, water an ounce. Take ten drops three times a day. November 5th: In addition to the above, cod-liver oil and whiskey were prescribed. November 25th: Twenty grains of quinine were given. November 27th: Ordered a drachm of the bromine mixture every two hours. The cod-liver oil and whiskey to be continued. January 1, 1865: Returned to barracks cured.

CASE 66.—Private Nathan Leeson, company A, 19th Virginia; admitted September 28, 1864. Acute dysentery. At the time of admission the patient had from twelve to fifteen very small, bloody stools daily. Treatment, solution of bromine. The patient improved rapidly, and in five days was convalescent. He was put on full diet October 4th, and discharged, cured, October 9th.

CASE 67.—Private John C. Blakney, company C, 40th Alabama; age 22; admitted September 28, 1864. Chronic dysentery. Has been sick for the past six weeks. The operations are frequent, sometimes twelve to fifteen daily; they are very small, and chiefly composed of blood. Treatment, solution of bromine. The patient improved rapidly, and was discharged, cured, October 5th.

CASE 68.—Corporal Samuel Smoot, company G, 31st Alabama; age 20; admitted September 29, 1864. Acute dysentery. Had operations every hour; they were small, painful, and composed chiefly of blood. Treatment, solution of bromine. October 5th: Is very much better. Has three or four passages daily; they are still small and thin, but contain no blood, and are not painful. October 9th: The patient has continued to improve; his bowels are regular and the passages natural. Is on full diet and quite convalescent. [According to the hospital register this man was returned to the barracks November 8th.]

CASE 69.—Private Joseph H. Hagans, company E, 1st Florida cavalry; age 23; admitted October 2, 1864. Acute dysentery. The patient had small painful stools nearly every hour; they were composed chiefly of blood. Treatment, solution of bromine. He immediately commenced improving; was put on full diet October 12th, and discharged, cured, October 16th.

CASE 70.—Private Anderson Edwards, company G, 3d Florida; admitted October 10, 1864. Acute dysentery. Has small, bloody, and very painful stools every hour. Treatment, solution of bromine. Improved very rapidly, and was discharged, cured, October 17th.

CASE 71.—Artemus T. Langston; admitted October 10, 1864. Acute dysentery. Had from ten to twelve operations daily; the stools were small, painful, and streaked with blood. Treatment, solution of bromine. The patient improved rapidly, and was discharged, cured, October 15th.

CASE 72.—Private Francis B. Murphy, company E, 62d Virginia; admitted October 10, 1864. Acute dysentery. Says he has been sick five days. The stools are small, bloody, and very frequent; they are accompanied with considerable pain. Treatment, solution of bromine. The patient improved rapidly, and was discharged, cured, October 17th.

CASE 73.—Private Henry Beamer, company F, 3d Confederate cavalry; admitted October 11, 1864. Acute diarrhœa. Had been sick eight days. His bowels were moved from eight to ten times a day. The stools were tolerably large, thin,

watery, and sometimes streaked with blood. Treatment, solution of bromine. The patient improved rapidly, was put on full diet October 16th, and was discharged, cured, October 20th.

CASE 74.—Private Thomas King, company L, 56th Alabama; temperate; admitted October 22, 1864. Chronic diarrhœa. This man had long suffered from intermittent fever every fall, and was troubled with indigestion at intervals. He has had diarrhœa since last June, alternating with spells of constipation. To take ten drops of iodine solution, two grains to the ounce, three times daily. October 24th: Half an ounce of castor oil. October 25th and 26th: Rest. October 27th: Half an ounce of castor oil. October 28th to November 4th: Rest. November 5th: An ounce of castor oil. November 6th to 13th: Rest. November 14th: A drachm of solution of bromine every two hours. November 26th: Returned to barracks.

CASE 75.—Private C. Wilkins White, company G, 13th Louisiana; temperate; admitted November 1, 1864. Chronic diarrhœa. The attack commenced June 25th as dysentery, with small, frequent stools, accompanied by tenesmus, and passed into a chronic diarrhœa, which has persisted ever since in spite of treatment. November 13th: To take ten drops of iodine solution, two grains to the ounce, three times daily. November 14th: To take a drachm of solution of bromine every two hours, and a pint of ale daily. November 22d: Substituted milk-punch for the ale. November 28th: Returned to the barracks cured. [According to the hospital register this man was readmitted December 20th with the same disease, and returned to the barracks February 9, 1865.]

## *Fatal Cases.*

CASE 76.—John G. Jones, citizen of Georgia; age 60; admitted June 4, 1864. Chronic diarrhœa. The patient was much debilitated and his left hand was paralyzed. The passages averaged one to the hour; the abdomen was painful, no appetite. There is no record of his treatment until he was put upon the solution of bromine in September. September 29th: Is very weak; the flux continues unchecked. September 30th: The passages are small and bloody; complains of sick stomach. Died October 1st. No autopsy. Acting Assistant Surgeon H. F. Gilbert.

CASE 77.—Private J. W. Nelson, company E, Herald's Arkansas battalion; temperate; admitted July 23, 1864. Diarrhœa of six months' standing. First seen by the reporter September 26th. The passages are painful and average one every hour; the stools are mucous; the legs and feet are œdematous and painful; the patient has no power over them. The patient labors under enthusiastic hallucinations. He has no appetite and is very much debilitated. He was attacked yesterday with a pain in the left side of the chest, which is more severe to-day. Treatment, a drachm of the solution of bromine every hour. Died October 2d. No autopsy. Acting Assistant Surgeon H. F. Gilbert.

CASE 78.—Private William Baily, company B, 2d Kentucky cavalry. Died October 19th. [A full account of the autopsy in this case is given by Acting Assistant Surgeon H. F. Gilbert in his report on the use of bromine, *supra*, p. 52.]

CASE 79.—Private James Turner, company B, 63d Virginia; age 33; admitted August 26, 1864. Chronic diarrhœa. Has been sick about twelve months, most of the time under medical treatment, but never free from diarrhœa more than a week at a time. Was treated with pills of nitrate of silver and opium, &c., until September 14th, when solution of bromine was prescribed. At this time he had frequent stools, which were small, nearly white, and sometimes streaked with blood; they were attended with a good deal of pain. September 21st: Substituted ten drops of iodine solution, two grains to the ounce, three times a day. October 9th: The patient has taken cold and had a relapse. The stools are again frequent, but not so thin as at first, and natural in color. November 13th: The diarrhœa still continues; resumed the solution of bromine. November 20th: The chest symptoms becoming severe, a blister five inches by six was applied to the left side of the chest. November 30th: To have a pint of milk-punch daily. Continue the bromine. December 9th: Continue treatment, and add the following: R. Sulphate of quinia twenty grains, opium five grains. Make five powders. Take one every four hours. December 10th: Repeat the quinine. December 11th: Cod-liver oil and whiskey; also enemata of ten drops of bromine to the ounce of water. Ten grains of Dover's powder at night. Died December 15th. *Autopsy* twenty hours after death: The left pleural cavity contained about a pint of bloody serum, in which a few flakes of lymph floated. The left lung was adherent to the thoracic parietes anteriorly, and infiltrated with tubercles, which in many places were softened and broken down; the parenchyma between them was much congested. The right lung was somewhat congested anteriorly, but otherwise healthy. The liver presented the nutmeg appearance. The stomach was normal. The intestines were apparently healthy, with the exception of the rectum, the mucous membrane of which was studded with chronic ulcers, some of which appeared to be healing; between them were puckered cicatrices of various dimensions, the largest the size of a five-cent piece. The mesenteric glands were enlarged. The other organs were healthy. Acting Assistant Surgeon H. F. Gilbert.

CASE 80.—Private George McDaniel, company G, 40th Alabama; age 45; admitted September 21, 1864. Chronic diarrhœa. The patient stated that he had been under treatment for this disease about fifteen months. He is very much emaciated; his skin dry and yellow; his tongue coated but somewhat moist. The stools are frequent, small, and muco-purulent; they are accompanied by griping and tenesmus. His feet and legs are œdematous, and so painful that he is unable to rest at night. Has some cough, with a white, tough, frothy mucous expectoration, and sibilant rales are heard over the entire chest. His stomach is irritable and he vomits frequently. Has no appetite for food, and will take only a small quantity of soup or beef-tea. To take a teaspoonful of bromine solution every three hours, and a warm bath. Under this treatment the pain ceased, the discharges became quite consistent, diminished in frequency, and there was some improvement in appetite. October 15th: The supply of bromine being exhausted, a solution of iodine was substituted. October 22d: The stools consist of bloody mucus; the pains have recurred with severity; the patient seems very weak. To take a Dover's powder at night. Milk-punch, beef-tea. October 30th: Continues to decline; complains of want of sleep and of a sense of suffocation; pulse very feeble and irregular. Died November 1th. For two days before his death he had been very dull and stupid. *Autopsy* twenty-

four hours after death: Body greatly emaciated. The pericardium contained eight ounces of serum. The heart was small and somewhat fatty. The left lung was adherent throughout; its posterior lobe was hepatized. The right pleural cavity contained about three pints of dirty fetid fluid. The right lung was crepitant throughout, but contained a few tubercles, which were black with pigment deposit. The abdominal cavity contained about two gallons of transparent fluid. The liver was apparently normal. The gall-bladder contained nine calculi. The stomach was normal. The large intestine was much thickened, and its mucous membrane was ulcerated. The kidneys were smooth and pale. Acting Assistant Surgeon H. F. Gilbert.

Case 81.—Private Peter R. Green, company H, 9th Georgia; admitted December 14, 1864. Chronic diarrhœa. This man was captured at Knoxville, Tennessee, December 5, 1863; arrived at this post January 6, 1864. Was taken sick January 13th, since which time he has not been well. Has been sent from the barracks to hospital several times. When first seen by the reporter, January 17, 1865, his pulse was 90 and feeble; he was extremely emaciated; tongue coated white. He had been treated by Dr. Gilbert with bromine for the last six days, during the last three of which he had no passage from the bowels. He complained greatly of abdominal pain. A tablespoonful of castor oil was, therefore, administered, which operated promptly. The stools were purulent. Subsequently pills of assafœtida and morphia were prescribed, with milk-punch and nourishing diet. He died January 31st. *Autopsy* eight hours after death: The pericardium contained between ten and twelve ounces of fluid. Both lungs were firmly adherent to the thoracic parietes and contained tubercles at their apices. The spleen was large and engorged with blood. The mucous membrane of the large intestine was in a gangrenous condition. Acting Assistant Surgeon H. F. Salter.

Case 82.—Private Edward Gilliom, company H, Wright's Arkansas battalion; admitted January 3, 1865. Chronic diarrhœa. The patient was under Dr. Gilbert's charge, and was treated with bromine solution and an occasional Dover's powder until January 16th, when he came under the care of the reporter. He was then very much emaciated, and had frequent purulent discharges, accompanied with pain and tenderness on pressure upon the lower part of the abdomen. He was subsequently treated with pills of nitrate of silver and opium, enemata of acetate of lead and starch-water, mercury with chalk and opium, &c. He died January 23d. *Autopsy:* The lungs, heart, liver, and spleen were healthy. The peritoneum generally was congested. The mucous membrane of the intestines was also congested. In the rectum the mucous membrane was gangrenous. Acting Assistant Surgeon H. F. Salter.

Case 83.—Private John R. Fisher, company E, 1st Florida; admitted January 13, 1865. Chronic diarrhœa. This man was taken prisoner November 25, 1863. He was attacked with diarrhœa about the middle of March, 1864, and has been troubled with it ever since. When admitted he was greatly emaciated, and had from seven to nine light-yellow, watery stools daily; his tongue was red and glazed, and his throat was sore; his pulse was 90 and small. This patient was treated by Dr. Gilbert with bromine until the 17th of January, when the reporter substituted creasote mixture and enemata containing acetate of lead. He was subsequently treated with pills of nitrate of silver and opium, acetate of lead and opium, &c., without benefit. Died February 2d. *Autopsy:* The lungs contained an excess of black pigment, otherwise the thoracic viscera were normal. The large intestine was highly congested and ulcerated, the rectum gangrenous. The mesenteric glands were much enlarged. Acting Assistant Surgeon H. F. Salter.

Case 84.—Private Joseph Laflat, company H, Thompson's regiment; admitted January 19, 1865. Chronic diarrhœa of over two months' standing. When admitted the patient was extremely emaciated, the stools were painful, the abdomen tender, the tongue coated, the countenance shrunken, the pulse 90 and full, the skin dry and harsh. Five grains of blue mass and a grain of opium were administered, and this was followed by a drachm of solution of bromine every two hours. This was continued until January 23d, without any improvement taking place. Subsequently pills of rhubarb, tannin, and opium, &c., were employed with temporary benefit. The stools were reduced in number to two a day, and appeared to be natural in character. January 31st, however, the diarrhœa recurred, accompanied by severe pain in the side, and the patient died during the night. *Autopsy* next day: The lower lobe of the left lung was hepatized. The pericardium contained four ounces of fluid. The liver was healthy. The spleen was about twice its natural size. There was an intussusception in the small intestine. The descending colon and rectum were extensively ulcerated. The mesenteric glands were enlarged. Acting Assistant Surgeon H. F. Salter.

Case 85.—Private Robert Hunter, Hodge's Missouri regiment; age 24; admitted January 21, 1865. Chronic diarrhœa. In this case the disease began with an attack of acute dysentery following a cold; this passed into chronic diarrhœa. When admitted the patient had no appetite; complained of nausea and pain in the bowels. The stools were slimy and frequent, the pulse 90 and soft; micturition was painful. To take a drachm of solution of bromine every three hours. This was continued for three days without benefit, when turpentine emulsion was substituted. Subsequently acetate of lead and opium, Hope's camphor-mixture, creasote mixture, &c., were employed. Died February 1st. *Autopsy* the same day: The lungs were tubercular. The pericardium contained six ounces of serum. The liver, spleen, and kidneys were healthy. The mucous membrane of the small intestine was congested and softened. The descending colon and rectum were very much thickened and ulcerated. Acting Assistant Surgeon H. F. Salter.

Case 86.—Robert Pritchet, Missouri conscript; age 18; admitted February 3, 1865. Diarrhœa. This man, who was of intemperate habits, was first taken sick with diarrhœa about Christmas, 1864. When admitted he was already much emaciated; his pulse was 80 and soft; his tongue coated. He had severe pain in the head, great thirst, and no appetite. The operations from the bowels ranged from fourteen to sixteen in the twenty-four hours; they were light-yellow and watery. He complained of pain in the chest, and had a cough, with difficult respiration. He was treated with bromine mixture, quinia, and milk-punch. February 5th: Is no better. Applied mustard plasters to chest and abdomen, and ordered enemata of sugar of lead and laudanum. Died February 6th. *Autopsy:* The pericardium contained about ten ounces of fluid. A large clot was found in the

right auricle of the heart. The right lung was completely hepatized, the left much congested. The liver was healthy; the gall-bladder distended with bile. The spleen was congested. There was an intussusception of the small intestine about eight inches long. The large intestine was highly congested and slightly ulcerated. Acting Assistant Surgeon H. F. Salter.

CASE 87.—Private William A. Burke, company G, 31st Alabama; admitted October 4, 1864. Chronic diarrhœa. Has been sick since November last. Was first seen by the reporter October 11th. To take ten drops of iodine solution, a grain to the ounce, three times a day. October 14th: A drachm of solution of bromine every two hours. October 15th: Add to the above fifteen grains of chlorate of potash three times daily. This treatment was continued till October 31st, when cod-liver oil was prescribed in addition. December 11th: The bromine solution was continued, and twenty drops of the tincture of the chloride of iron, three times daily, substituted for the other remedies. Acting Assistant Surgeon H. F. Gilbert.

January 1, 1865, Acting Assistant Surgeon W. Mathews took charge of the ward and found the patient suffering with fever, chills, and excessive tormina in addition to the ordinary symptoms of diarrhœa; he prescribed a solution of quinine and morphia. Died January 6th. *Autopsy* ten hours after death: There were extensive pleuritic adhesions on the right side, and numerous melanotic patches on the surface of both lungs. The liver and spleen were small and pale. The gall-bladder was greatly distended with a dark, gelatinous fluid. The descending colon and rectum were extensively ulcerated; the rectum so much so that it tore when handled in the gentlest manner. No other abnormities were observed.

CASE 88.—Private William J. Nichols, company E, 19th Alabama; age 27; admitted June 23, 1864. Chronic diarrhœa. This man was first seen by the reporter about November 25th. He was then very ill. He was treated with solution of bromine, and seemed to be getting along tolerably well until December 24th, when he was taken suddenly worse, and died December 25th. *Autopsy* four hours after death: There were extensive tubercular deposits in both lungs. The heart was normal. The mesentery was congested and the mesenteric glands much enlarged. The mucous membrane of the intestines was very much diseased, especially that of the large intestine and rectum. Indurated spots and cicatrices were numerous in the small intestines. Acting Assistant Surgeon J. B. Young.

CASE 89.—Private Allen T. Stott, company F, 5th Kentucky; age 49; admitted November 26, 1864. Chronic diarrhœa. This man was transferred to Rock Island barracks June 27th. Shortly after, he had an attack of erysipelas, which was treated in this hospital. He states that he has been troubled with diarrhœa ever since. When admitted he did not appear to be very sick, but he gradually grew worse, and died January 31, 1865. During the first few weeks after admission he was treated with bromine, but growing worse, salines in small doses, with opium, were substituted; stimulants and tonics were also employed. *Autopsy* twelve hours after death: There were firm, old adhesions on the right side, and some evidences of recent pleurisy on both sides. The right cavities of the heart contained large fibrinous clots. The liver and spleen were congested and softened. The mucous membrane of the large intestines was softened, ulcerated, and in places gangrenous, the descending colon and rectum being most diseased; the ulcers in many places had penetrated to the peritoneum. The mesenteric glands were enlarged. Acting Assistant Surgeon J. B. Young.

CASE 90.—Private David Chapman, company E, 16th South Carolina; age 20; admitted November 27, 1864. Diarrhœa and consumption. This man had been in hospital twice before. He was much emaciated and dispirited; had considerable cough and pain in the chest. The diarrhœa was very troublesome, his bowels being moved from ten to twenty times daily. His pulse was quick and feeble; tongue dry and narrow. He was treated with bromine, iodide of potassium and opium, muriate of ammonia, Dover's powder, &c. Had wine and whiskey as stimulants. Died February 1, 1865. *Autopsy* six hours after death: Both lungs were full of tubercles and contained numerous vomicæ; the right lung was most diseased. The heart was normal and contained a large fibrinous clot. The liver was adherent to the diaphragm, congested, and softened. The spleen was shrunken. The mesenteric glands were enlarged. The omentum was shrunken and congested. The mucous membrane of the large intestine was thickened and softened. The lower portion of the colon and rectum were extensively ulcerated. Acting Assistant Surgeon J. B. Young.

CASE 91.—Samuel D. Smart, Government employé; age 36; admitted December 17, 1864. Chronic diarrhœa. When admitted this man had a frequent, feeble pulse; his tongue was dry and brown, his surface cold and blue. He complained of dyspnœa and was anxious and restless. Treatment, bromine, opiates, &c. Died December 25th. *Autopsy* twelve hours after death: There were extensive pleuritic adhesions on both sides, and tubercles at the apices of both lungs. Some effused serum was found in the pericardium, and a considerable quantity in the peritoneal cavity. The large intestine was extensively ulcerated. The mesenteric glands were enlarged. Acting Assistant Surgeon J. B. Young.

## *Extract from a letter by* Surgeon MORSE K. TAYLOR, U. S. Volunteers. *Keokuk hospital, Iowa, September* 9, 1864.

* * * In those cases in which the disease is purely diarrhœa, and a morbid condition of the bowels is confined to the small intestines, viz: the ileum, and occasionally the jejunum, there have been no ulcerations of the mucous membrane present. There is vascularity, oftentimes giving rise (and I may say that it is nearly always the case) to the "mahogany appearance" mentioned by Dr. Tripler; sub-mucous infiltration and thickening of the mucous membrane, such as we sometimes see in chronic bronchitis; and in some cases there is softening and erosion of the epithelial surface, but never well defined as in acute inflammations or ulcerations of the same parts. Peyer's patches I have never seen involved in this disease. In one specimen I have in my possession, a Peyer's patch is surrounded by thickening, plastic effusion, vascular injection, &c., all showing a high grade of action; but the patch itself is entirely normal. This I have seen in many instances. The solitary follicles are almost invariably enlarged. The only exception to these appearances, as I have yet observed them, is in the

immediate vicinity of the ileocæcal valve, where erosions and jagged ulcers occur in almost every case when that part of the intestine is involved, which, as a general thing, is not oftener than one case in four.

When the colon is involved, however, the morbid appearances are far different, and erosions, jagged ulcers, and great vascular injection are present in all the cases coming under my notice. There is another condition of the colon which has some interesting features, namely: In diarrhœa it is always contracted, oftentimes not larger than the finger, while, when the passages are accompanied with tormina and tenesmus, the disease being dysenteric in its character, the colon has been less contracted, and in some cases considerably distended with gas in a portion of its course. When the principal disease is located in the region of the ileocæcal valve, distension is nearly always present. As I have before stated, colitis is the less common affection, and when it has occurred the symptoms have been those of chronic dysentery.

* * * More than half of the cases of cardiac disease coming under my notice belong to the right side, which is so different from what we observe in private life. I am disposed to account for this on the grounds of the great frequency of pulmonary diseases in the army, particularly pneumonia, chronic bronchitis following measles, interference with the functions of respiration by the belts and great weight borne upon the chest by the soldier, and the scorbutic condition, in which the muscular tissue is more or less enfeebled, particularly that of the heart, so that when undue labor is thrown upon it, as in heavy and rapid marchings, strong mental excitement, &c., the walls yield, and more or less permanent results follow in the way of dilatation of the right ventricle and imperfect closure of the tricuspid valves. I have only secured, as yet, three morbid specimens, while I have examined nearly one hundred and fifty cases in all. * * *

### *Extract from the Report of* Surgeon William M. Wright, 79th Pennsylvania Volunteers. *Thomas general field hospital, Kingston, Georgia, September* 30, 1864.

The disease which has resulted in the greatest fatality and presented the greatest difficulty of treatment at this hospital is chronic diarrhœa. In certain of its stages it is quite tractable, but in others indomitable. The cases in which a judicious course of treatment was pursued before emaciation was conspicuous generally terminated favorably; but in those cases in which emaciation had progressed and there was a retracted, hard, and tender abdomen, a dry and glazed tongue, and an altered vocal intonation, the mortality was very great. The majority of such cases exhibited evidences of a scorbutic taint. Such was the fact in a marked degree in the cases received at this hospital from the front, on the 30th of July last. Malaria existed in quite a number of them. If the hæmorrhage from the bowels was at all considerable, all modes of treatment were ineffectual. The most efficient treatment of this disease has been the administration of a mixture of nitro-muriatic acid prepared after this formula: ℞. Nitro-muriatic acid one fluid drachm, tincture of opium half a fluid ounce, compound spirits of lavender three fluid drachms, peppermint water six fluid ounces. Mix. A fluid drachm of this mixture, given every two or three hours, according to the severity of the case, produced prompt and effectual relief, which, with a carefully restricted diet, was permanent. In cases of greater gravity it was necessary to continue the mixture for some days to obtain the same results. In those cases in which extreme emaciation existed, favorable results were obtained from the internal and external use of nitrate of silver—internally in quarter-grain doses thrice daily, and applied externally over the full extent of the abdominal surface. The effects of the nitrate thus used were a cessation of the diarrhœa, a healthy appearance of the tongue, a softening of the skin, &c. A majority of these cases have terminated fatally, and apparently from inanition.

### *Extract from the Report of* Acting Assistant Surgeon Thomas C. Mercer *to* Surgeon M. Goldsmith, U. S. Volunteers, *in charge of Jefferson hospital, Jeffersonville, Indiana, on articles of food found in the stools of patients laboring under chronic diarrhœa. March* 27, 1865.

On examination of the stools of patients laboring under chronic diarrhœa, recently received from Eastport, Mississippi, into ward 7, I have discovered the following articles of food in an undigested condition. The quantity of excrement besides the undigested matters was not large, but very liquid: Bed 36: Onions, meat, and bread-crusts—the onions in excess and, perhaps, half a pint in quantity. Bed 37: Eggs, raisins, and bread in about equal quantities; perhaps, in thirteen stools, enough to fill a pint measure. Bed 39: Onions, about half a pint in nine stools. Bed 40: Bread-crusts not properly masticated, and unaltered by retention in the stomach, not even rendered soft by the surrounding liquid; about one pint in seven stools. Bed 41: Bread-crusts, meat, and eggs, about one pint in six stools. Bed 28: Milk, pure and unaltered by its retention in the stomach and bowels, perhaps two-thirds of a pint in quantity.

The patients assured me that such had been their condition for some weeks; that whatever they ate passed undigested. Many examinations of the washings of the stools, of which the above are fair samples, have led me to believe that chronic diarrhœa, as it exists in the army, is a course of purgings kept alive by ingesta, which from the atony of the stomach and bowels is not altered by its retention, but is allowed to gravitate and move on by the liquid contents until a desire is created to void the contents, and it reaches the "stool" in the aforesaid condition.

### *Special Report on cases of acute dysentery occurring in the detachment of troops stationed at Columbia, South Carolina, by* Assistant Surgeon Elliott Coues, U.S.A. *November* 30, 1868.

[The following report, descriptive of a number of cases of acute dysentery which occurred in the garrison at Columbia, South Carolina, in the fall of 1868, is here presented because it was similar in its character to many of the local epidemics which occurred during the war, in which, however, no autopsies were made. An abstract of the principal diseases at the post during the last six months of 1868 has been prepared from the monthly sick reports, and is appended to the report of Assistant Surgeon Coues.]

I have the honor to accompany my monthly report of sick and wounded for November with the following remarks:

With the first cold weather, which occurred in October, there was, as usual, a marked falling off in the number of cases of malarial fever; simultaneously with which a malignant and very intractable form of dysentery sprang up, which, though not to be called epidemic, has been marked by the severity that ordinarily characterizes epidemics, and differs from anything that I have before observed at this post in this and some other respects. The citizen physicians have not met with such cases in their practice. The disease is confined to the garrison, and has particularly affected company H of the eighth infantry. The hygienic conditions of the camp are good; those of company H differing in no way that I can discover. I cannot point to the immediate cause of the disease, but I think its connection with malaria as the ultimate cause is in the highest degree probable, if not demonstrable. The disease appears to result from a special localization and development of the miasmatic poison. With this endemic origin predisposing causes are presumably to be found in the general habits of life, condition of the system, &c., and exciting causes in exposure in the line of duty, imprudent irregularities, &c.; but the number of cases observed is too small to permit satisfactory statistical analysis. Details of three fatal cases, to serve as the histories of the specimens forwarded to the Museum, are given in the accompanying report. The following is a sketch of the natural history of the disease, derived from about twenty cases, the remarkable similarity of which in all essential features renders one description applicable to all:

The attack is ushered in by moderate febrile action, with pains in various parts of the body, headache, sleeplessness, loss of appetite, thirst, heavily-coated tongue, and the ordinary tormina, relieved by frequent tenesmic stools, which shortly become muco-sanguineous, the florid blood definitely streaking the frothy mucus, of which the light-colored fæces chiefly consist, after the large intestine has been emptied. The prostration of strength is not great for the first few days, and there is little to indicate more than an ordinary attack of dysentery. During this stage I have reason to believe that prompt treatment prevented further mischief in several instances; but in most cases the inflammation proceeded to further development, treatment proving scarcely palliative. The next symptom is suppression of urine, which occurred in every case at a period varying from the third to the tenth day, of a varying degree of severity, amounting in some cases to total stoppage, and liable to recur at irregular intervals during the course of the disease. This complication ordinarily yielded in a few hours to moderate doses of acetate of potash given every half hour. The hepatic functions do not appear noticeably disordered, nor to have any special relation to the disease. Mercury seems contra-indicated in most instances. Aside from the anorexia the stomach is not affected. Emesis is unusual, apparently only casual; in only one case was it continued; whenever occurring, the ejected matters are generally tinged with bile. The tongue remains persistently furred or coated for a period varying from one to two or three weeks. When it cleans off, if the patient is convalescing, it resumes a natural condition, otherwise it becomes of a uniform bright red, at first soft and moist; a change from which condition to a hard, dry, red one, accompanies each exacerbation of the disease, and is an extremely unfavorable symptom. In two of the fatal cases it was persistent to the last; in the third, the most protracted one, the tongue became covered with a hard, brown, broken crust, as in cases of typhoid fever. The teeth collected sordes in each of these cases, not in the others.

The stools change their character frequently, irregularly, and without assignable cause. The muco-sanguineous stage is of comparatively short duration, as already stated, but subsequently discharges may occur at intervals and for a varying length of time, consisting mainly of frothy, greenish mucus, accompanied by dark blood. Calomel would neither produce nor alter this condition. The discharges, in fact, do not, as a general rule, continue of a dysenteric character, rather resembling those of chronic diarrhœa, except in the presence of blood. When least frequent they are apt to be thicker, darker, and very fetid; the mucus is frequently glairy and tenacious. Toward the last, in the fatal cases, the blood increases in quantity and becomes grumous, and may be passed almost free from true fæcal matters. In one of the cases the fatal result was precipitated by a sudden profuse hæmorrhage of clear blood. Only one of the cases lingered so long that the passages became involuntary. The tormina, though constantly recurring, and at times very severe, is usually transient. The patient refers the griping to the pit of the stomach, *i. e.* to the transverse colon. Tenesmus, though frequent, is not ordinarily a prominent or very distressing symptom, for the reason, as shown by the autopsies, that the disease was most intense at the upper part of the large intestine, leaving the rectum comparatively in good order. The passages sometimes number thirty or forty in a day and night; at other times are reduced to two or three, without assignable reason; a dozen is the average. The change in number may be as sudden as it is unaccountable. Some patients are troubled more in daytime, others chiefly during the night. Paroxysms of pain and urgent calls are apt to occur about daybreak or during the two or three hours preceding. There are no indications of peritoneal inflammation, and there is no tympanites. The abdomen is flaccid and painful upon palpation, especially along the course of the colon. Occasionally palpation excites painful spasmodic action of the intestine, when the course of the cæcum and ascending colon particularly may be traced, the gut feeling like a hard-knotted cord. The accompanying fever is of a purely asthenic type, and the general condition of the patient, in the protracted cases, is that of one suffering with typhoid fever. The skin is occasionally harsh and dry, but this condition is transient, occurring only during exacerbations of other symptoms; at other times it has the natural temperature and moisture. Sudamina were not observed. The pulse varies so irregularly as to offer no satisfactory indications.

I have already mentioned the presumed and highly probable malarial origin, or at least connection, of this dysentery. The supposition is confirmed by the unmistakable signs of periodicity manifested through its course. In earlier stages the symptoms are purely intermittent; later they became remittent, still later, when the pathological conditions below described are established, periodicity is obscured or lost; but though thus masked, as it were, and overshadowed, as far as the original phase is concerned, periodicity is developed in another and highly interesting way, viz: A weekly exacerbation of the fever and other systemic symptoms, thirst, anorexia, insomnia, &c., the dysenteric symptoms remaining the same or being but slightly aggravated. This condition generally lasts for twenty-four or forty-eight hours. Although the number of my cases is so small, the length of time that most of them have been under observation assures me that I am not deceived in ascribing this tendency to exacerbation upon the seventh or eighth day. The liability to relapse, properly so called, as distinguished from tertian or weekly changes, appears imminent. Two cases, so far convalescent as to be able to be about, relapsed into their previous condition without traceable cause. The average duration of the fully developed disease cannot yet be exactly stated, but may be

considered as from six weeks to two months, so that the term chronic becomes applicable, though there is no obvious distinction, except as to time, between any of the cases in which the disease became fairly established. Not reckoning those cases that were never fully developed, the briefest case was one of two weeks' duration. The first fatal case terminated in three weeks by a sudden hæmorrhage, the other two lasted respectively five and six weeks. A number remain under treatment.

Treatment has proved to the last degree unsatisfactory. The few cases that were arrested in the beginning were apparently cured by castor oil and laudanum, followed by opium and quinia in large doses, with strict dietetic regimen and absolute rest in bed. For other cases, after trial of various agents reported remedial, I have fallen back upon the constant and free exhibition of opium combined with quinine in tonic doses, and a small quantity of nitrate of silver. Ipecacuanha in large doses excited vomiting, but appeared otherwise inert except in one case, where it seemed to do good and was consequently persevered in. Calomel gave negative results; so also did several mineral astringents. Mercury and chalk with Dover's powder, and aromatic sulphuric acid occasionally appeared to be beneficial, but their continual exhibition irritated the stomach. Brandy and laudanum, with sinapisms to the abdomen, gave temporary relief from tormina. Opiated mucilaginous injections restrained the tenesmus and diminished somewhat the frequency of the stools. Emulsion of oil of turpentine, in one case, improved the appearance of the tongue for a while. Alcoholic stimulation was clearly indicated after the first stage; brandy was the best form, whiskey the next. Tarragona wine invariably made the patient worse. I enforced every precaution in diet, allowing as little food as possible in the early stages, and that of the blandest and lightest nature. As the demand for more nourishment became evident, I gave beef-tea, chicken-broth, soft boiled eggs, and milk, especially in the form of milk-punch, in addition to the articles previously used, such as farina, corn-starch, gelatine, toasted cracker and tea, &c.

Although I do not credit the disease with being contagious, there is some reason to believe that one or two cases occurred in hospital that might not have arisen had not other cases been present. As a matter of ordinary precaution stools were always promptly removed, and vessels cleansed with chlorinated soda or solution of permanganate of potash. Bedding was changed as soon as soiled, and the wards frequently disinfected with Squibb's chlorine mixture.

*Post mortem* appearances account for the intractability of the disease and clearly indicate its pathology. Its restriction to the large intestine without serious interference with other organs is interesting, considering the intensity of the inflammation and the grave constitutional symptoms. The focus of the disease is at the cæcum in one direction, the inflammation stopping abruptly at the ileocæcal valve; in the other it extends, lessening in severity, to the anus. It is not extended by contiguity of tissue from the transverse colon to the stomach. The kidneys, though functionally deranged, exhibit no structural lesions. The peritoneal investment of the bowels suffers least; no inflammation is excited in the serous lining of the abdomen. Inflammation of the mucous membrane is most intense, and results, in extreme cases, in disorganization and consequent sloughing over a great part of the tract. Where the mucous membrane is not thus extensively destroyed, large circumscribed ulcers occur. In two specimens the coats of the intestine were much thickened and indurated except where the ulcers were situated. In one they were unusually thin, and very easily lacerated. The caliber of the affected tube was lessened in two cases, not so, however, in the other. Other structural lesions, needless here to particularize, are exhibited by the specimens forwarded.

*Abstract of the monthly reports of sick and wounded of the detachment* stationed at Columbia, South Carolina, from July 1 to December 31, 1868.*

| Month | July. | | August. | | September. | | October. | | November. | | December. | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total mean strength | 471 | | 532 | | 637 | | 348 | | 354 | | 503 | | | |
| Disease. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. |
| Typhoid Fever | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 1 | 1 | 1 |
| Typho-malarial Fever | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 1 | ..... | ..... | ..... | ..... | 1 | 1 |
| Remittent Fever | 18 | ..... | 15 | ..... | 14 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | 49 | ..... |
| Intermittent Fever | 79 | ..... | 38 | ..... | 69 | ..... | 35 | ..... | 19 | ..... | 29 | ..... | 269 | ..... |
| Diarrhœa | 36 | ..... | 27 | ..... | 11 | ..... | 10 | ..... | 3 | ..... | 5 | ..... | 92 | ..... |
| Dysentery | 2 | ..... | 4 | ..... | ..... | ..... | 10 | ..... | 6 | 3 | 2 | ..... | 24 | 3 |
| Venereal Diseases | 7 | ..... | 23 | ..... | 11 | ..... | 11 | ..... | 14 | ..... | 10 | ..... | 76 | ..... |
| All other Diseases | 30 | ..... | 31 | ..... | 56 | ..... | 20 | ..... | 11 | ..... | 32 | ..... | 180 | ..... |
| Wounds, Accidents, and Injuries | 2 | ..... | 11 | ..... | 10 | ..... | 12 | ..... | 6 | ..... | 8 | ..... | 49 | ..... |
| Total | 174 | ..... | 149 | ..... | 171 | ..... | 101 | 1 | 59 | 3 | 87 | 1 | 741 | 5 |

Case 92.—Private Thomas Jones, company H, 8th United States infantry; a man of full habit of body; intemperate; age about 35; admitted October 21, 1868. Acute dysentery. The patient stated that he had suffered for some time with looseness of the bowels, to which he had paid no attention until the "bloody-flux" appeared. He then had tormina, tenesmus, anorexia, insomnia, cephalalgia, violent thirst, hot, dry, harsh skin, tongue heavily coated, fifteen to twenty muco-sanguineous

* The command consisted of company E, 3d artillery, companies B and H, 5th artillery, and part of the 8th infantry.

small liquid stools daily. On the third day there was complete suppression of urine, which continued for twenty four hours. The symptoms were modified but little during the course of the disease, except that the remitting character of the affection gave some days of comparative ease from pain, with infrequent stools, more appetite, better sleep, &c. The emaciation, though marked, was not extreme. The tongue cleaned after the third day, and became light red, soft, and moist; toward the last it became hard and dry. There was great pain on pressure along the colon, and particularly in the right iliac fossa. The patient also complained of great pain in the right hypochondrium accompanying the respiratory movements. This pain was described as a stitch. The stools changed so frequently in character and quantity that it is difficult to describe them comprehensively. Toward the last they became less mucous and more bloody; the fæcal portion was always liquid, dark and fetid, the blood mostly dark and grumous, but containing some of more florid hue. Up to a few hours before death there was no aggravation of symptoms. Death occurred suddenly, from a profuse hæmorrhage per anum, apparently of arterial blood, occurring while the patient was straining at stool. A pint or more of blood was lost. Died November 11th. *Autopsy:* The stomach and small intestine were perfectly healthy. No lesions of any organs except the liver and large intestine were observed. The liver was occupied by an enormous abscess, pointing and about to break through the diaphragm into the right pleural sac, almost pointing also below, several square inches of the under surface of the organ being soft and of a dull-green color. The intestinal tract, from the ileocæcal valve to the anus, was highly inflamed; its coats were thickened and indurated. The mucous membrane was soft, sloughing, or already disorganized and lost at certain parts. Several large ulcers were produced by the separation of the sloughs exposing the muscular coat. The lesions were most marked in the cæcum and the adjoining parts of the colon; thence extending to the rectum, but not invading the ileum. [No. 995, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the cæcum and ascending colon, which is somewhat thickened, and presents a number of extensive diphtheritic ulcers, some of which penetrate to the muscular coat. The mucous membrane between them is frosted with pseudo-membrane. The ulcers in many places communicate freely with each other, so that the intervening mucous membrane, the total area of which is rather less than that of the ulcers, appears as islands of irregular form.]

CASE 93.—Private Charles Smith, company H, 8th United States infantry; a slightly built youth; age about 21; good habits and no other organic disease; admitted October 11, 1868. Had previously suffered with malarial fever. The dysenteric symptoms were essentially the same as in the case of Private Thomas Jones, but from the greater duration of the disease the emaciation became extreme. Toward the last the passages were discharged involuntarily, and little or no blood was passed except during the forty-eight hours preceding death, when the amount of grumous blood was considerable. The tongue, after having cleaned, became covered with a hard, cracked crust. The general aspect of the patient was that of one suffering from true typhoid fever. During the five weeks of the disease there were many remissions, at first occurring every two or three days, but subsequently less frequently. The symptoms once abated so decidedly that their subsequent recurrence might almost be regarded as a true relapse after partial recovery. The pulse ranged from 120 to 140 during the last few days. Death was very gradual, and apparently from exhaustion. Died November 16th. *Autopsy:* All the organs except the large intestine were healthy. The latter was in very much the same condition of ulceration as in the case of Thomas Jones, but the walls of the colon were rather thinner than usual, instead of thicker, and very easily lacerated; the caliber of the tube was not lessened. The same restriction of the disease at the termination of the ileum was observed. The inflammation was more evenly distributed thence to the rectum. [No. 996, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the cæcum and ascending colon. In the lower half of the piece the mucous membrane presents a few minute follicular ulcers, and in some places is thinly plastered with pseudo-membrane. The mucous membrane of the upper half has been almost entirely destroyed by the separation of extensive diphtheritic sloughs, leaving an irregular ulcerated surface, in the midst of which there are several small islets of nearly normal mucous membrane. There is a considerable quantity of adipose tissue on the peritoneal surface of the gut.]

CASE 94.—Private Donald Gray, company H, 8th United States infantry; age about 40; intemperate; admitted September 12, 1868. General debility from intermittent fever and consumption. The symptoms of the latter disease were not severe. The ague disappeared under proper treatment, and the general condition of the patient improved until the dysenteric symptoms made their appearance. These were at no time so severe nor so continuous as in the cases of Smith and Jones, nor did they adequately express the highly diseased condition in which the colon was found after death. They were purely intermittent, like the original malarial disease. At times the discharges only numbered one or two in the twenty-four hours, and the patient experienced but slight pain in the abdomen; generally little or no mucus was passed, and the stools had the appearance of ordinary diarrhœal ones; but during the exacerbations, which occurred irregularly, on an average not oftener than once a week, the tormina and tenesmus were severe. At such times the tongue was sometimes furred, sometimes clean and red; the passages were quite bloody, and as many as twenty a day. This was their character during the last week of life. Vomiting of greenish mucus also accompanied the exacerbations, and was a frequent and distressing symptom. The suppression of urine was less marked than in other cases. Died November 25th. *Autopsy:* There were a few tubercles at the apex of the left lung; the upper lobe of the right lung was full of tubercles, and contained a cavity of moderate size full of mucus and pus. The heart was perfectly healthy. The liver presented a good example of the so-called drunkard's liver. The stomach was healthy, with the exception of some slight reddening of the mucous membrane, and the small intestine was also healthy, except the lower part of the ileum, which was thickened and coated with pseudo-membrane. The walls of the large intestine were enormously thickened and indurated, except part of the cæcum, which was thin and rotten, tearing readily while being removed. The mucous membrane was disorganized and had sloughed away from nearly the whole of the tract, hanging in long slimy shreds at some parts. The colon appeared to be unusually short. [No. 997, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the very much thickened cæcum and ascending colon, the mucous membrane of which has been coated with pseudo-membrane, and is in a sloughing condition; one slough, nine inches long, is still attached at one extremity, and hangs from the upper part of the piece. There is a good deal of adipose tissue on the peritoneal surface of the gut.]

*Extract from a Letter by* Dr. JOHN G. F. HOLSTON, late Surgeon of Volunteers and Brevet Lieutenant Colonel. *Washington, D. C., June* 7, 1870.

* * * Whenever large armies are moving in the field diarrhœa and dysentery occur, owing to the irregularity of the soldiers' diet, to exposure to cold when heated and fatigued, and to malaria. * * * The chief cause, however, seems to be malaria, or that unknown influence which causes ague and is counteracted by quinia; therefore the majority of cases will be found to have commenced in the fall months, and cannot be cured without quinia, if at all. Indeed a large proportion remain uncured under any treatment. Every variety of remedies has been employed, such as Epsom salts with tartar emetic, bismuth in large doses, mercury with chalk and opium, acetate of lead and opium, &c., but none of them have in my hands proved reliable.

The only thing at all deserving to be called a remedy, which I have tried, has been sulphate of copper combined with morphia, quinine, and capsicum. My general formula has been as follows: ℞. Sulphate of copper four grains, sulphate of morphia two grains, sulphate of quinia twelve grains, capsicum four grains. Make twelve pills; take one every four hours. The individual ingredients in this formula may be increased or diminished according to circumstances. For example, should there be a great deal of pain, I increase the morphia. Pain, however, is not always present. Should the discharges obstinately increase in frequency, I increase the quantity of the copper-salt until some degree of nausea is experienced. Wine and other alcoholic stimulants should be used as required, but beer is generally injurious, and even wine will require cautious watching. The diet should be such as is chiefly digested in the stomach, but as nourishing as possible. * * * This plan I adopted at the close of the Mexican war, and have followed ever since, not finding anything better. * * *

*Extract from the Report of* Surgeon EZRA READ, 21st Indiana Volunteers. *Camp Dix, Baltimore, Maryland, September* 5, 1861.

Diarrhœa has been treated with drachm doses of sulphate of magnesia every three or four hours, for twenty-four or thirty-six hours, followed with quinine until the intestinal tonicity has been restored. This treatment has been in all respects satisfactory to me, and is preferred to the use of astringents and mercurials.

*Extract from the Report of* Surgeon DE WITT C. VAN SLYCK, 35th New York Volunteers. *Falls Church, Virginia, quarter ending September* 30, 1861.

The 35th New York volunteers was organized June 3, 1861, at Elmira, New York, and remained at that station till July 10th, when they were ordered to Washington. During this period of about five weeks nearly one hundred cases of rubeola occurred among the men, the disease taking on a severe and, in many instances, a malignant form. The sequelæ were more than usually abundant, and laid the foundation of much subsequent disease, which was developed under the influence of exciting causes.

The regiment arrived in Washington July 12th, and was unfortunate in the selection of a camp, much of the ground being inundated by the heavy rains which fell during the latter part of the month. The loss of a portion of the camp equipage by fire and the poor quality of many of the remaining tents made it impossible for the men to keep dry, and the cold drenching rain of the 22d and 23d of July was the exciting cause of more than three hundred cases of diarrhœa and dysentery during the remainder of the month. These cases of diarrhœa were rather severe and obstinate in their character, and usually terminated in dysentery unless promptly checked by remedies; nearly all of them had bilious complications, and were treated accordingly. Blue mass was freely given in the first instance, followed by opiates, capsicum, and stimulants. The value of this treatment may be estimated by the fact that no deaths resulted.

About August 1st the regiment crossed the Potomac and encamped three-quarters of a mile southwest of Arlington house. Here, again, the selection of a locality for the camp was particularly unfortunate. It was a nearly level flat with rising ground on two sides, not susceptible of being thoroughly drained, and covered by a dense growth of wood admitting of neither sun nor air. The ground was covered by a thick layer of decayed vegetable matter. During a rain everything was saturated with moisture, and remained so several days after the weather became clear and pleasant.

At this season of the year the heat was particularly oppressive to men coming from northern New York, and who, though debilitated by previous disease and sudden change of climate, were constantly over-worked in the construction of fortifications, felling timber, and by severe drills. Fever soon made its appearance in the camp, and rapidly increased in frequency and malignity until September 1st, when, at the earnest solicitation of the senior medical officer, the camp was moved to higher ground in the rear of Fort Tillinghast, where it remained till the close of the quarter. During the latter part of August the undergrowth and a portion of the timber was removed, only to admit the sun and increase malarious exhalations. During the months of August and September more than five hundred cases of fever were treated, the duration of which was from four to five days to as many weeks. The first cases were intermittent in type, with a tendency to enteric disease. It soon after took on a remitting form, and finally assumed a low typhoid grade, and in many cases was exceedingly malignant.

The treatment consisted almost entirely of a mild mercurial laxative, generally blue mass, followed by large doses of quinine, and occasionally anodynes and sudorifics. From twenty to sixty grains of the sulphate of quinine per day were administered, and if this did not entirely eradicate the disease within the first week, it modified and reduced its malignancy and duration. No other form of treatment was found efficacious, though other approved remedies were fairly tested. Mixed and complicated cases were of course treated according to indications. During the last stages of the disease stimulants were given with manifest advantage.

In nearly all the malignant cases patches of sudamina and petechiæ covered the abdomen. From the abdominal tenderness and the obstinate diarrhœa which these cases exhibited, it was evident that the intestinal follicles were seriously involved. This condition of the intestines was frequently prolonged, and greatly retarded convalescence. No opportunities were afforded for *post mortem* examinations, and only two cases proved fatal. Convalescence was necessarily slow, and in very many cases relapses followed imprudence in diet and exercise.

After the removal of the camp, febrile diseases were less frequent and milder in character, but although the causes above enumerated were partially removed, yet their effects will doubtless be more or less felt during the autumn and winter.

During the month of September the health of the men gradually improved, and at the close of the quarter fever had sensibly diminished. There were, however, a great number of convalescents who were the victims of various acts of imprudence on their own parts, and of the vicissitudes of the weather and the asperities of the service; diarrhœa, dysentery, and rheumatism were the consequences.

## *Extract from the Report of* Assistant Surgeon Samuel A. Storrow, U. S. A. *Fort Washington, Maryland, for the quarter ending September* 30, 1861.

When first placed as medical officer at this post, I found much tendency to diarrhœa and milder forms of dysentery, produced by the use of the river water, which holds both lime and magnesia in solution. This source of trouble has been remedied for the future by having a well sunk in one of the bastions, which it is believed will afford a sufficient quantity of purer water, though its chemical constituents have not yet been ascertained by analysis.

## *Extract from the Report of* Acting Assistant Surgeon William A. Bradley, jr., U. S. A. *Upton's hill, Virginia, September* 30, 1861.

This command consists of companies A and M, 2d artillery, and company G, 1st artillery, in all three hundred and eighty-six officers and men. The diseases which were most prevalent when I joined the command, August 2, 1861, were cases of acute diarrhœa and a mild form of dysentery, which generally yielded readily to a purge of calomel combined with some cathartic, followed by quinine in small doses. These cases were generally complicated with slight hepatic or splenic congestion. Intermittent fever did not exhibit itself in a decided manner until toward September, when a tolerably large number of cases appeared, mostly among those of our men who had been stationed in Florida or Texas. All the cases have been either of the quotidian or tertian type, and have generally been subdued by moderate doses of quinine.

## *Extract from the Report of* Surgeon Cyrus N. Chamberlain, 10th Massachusetts Volunteers. *Washington, D. C., quarter ending September* 30, 1861.

The 10th Massachusetts regiment was recruited from the hills and valleys of the four western counties of Massachusetts, and is composed of men most of whom had been engaged in agricultural and mechanical pursuits. We were mustered into the service of the United States June 21, 1861, at Springfield, Massachusetts, where we remained in barracks until the 18th of July, when we removed to Medford, Massachusetts, near Boston, preparatory to our departure for the seat of war. We sailed from Boston on the 25th of July, in the steamers S. R. Spaulding and Ben Deford, and arrived in Washington on the 28th, and on the following day moved to Kalorama and encamped on ground just vacated by a New York regiment. We remained at Kalorama about ten days, when, having been attached to General Couch's brigade, we were ordered to march to Brightwood, five miles north of the city of Washington, on the Seventh street road. We again changed our encampment three days later for our present locality, one mile north of our last encampment and six miles from Washington. Our present site is apparently a healthy and salubrious one, on a moderate elevation, exposed on the north and south, and bordered partially on the east and west by groves of trees, through which small rivulets, which supply us with an abundance of tolerable water, find their way.

When I joined the regiment at Springfield I found several cases of measles existing, and although the most diligent efforts were made to prevent the spread of the infectious disease by isolating those already suffering from it, it has continued to follow us until very recently, there having occurred in all more than a hundred cases. I am happy in being able to state that no patient died of this disease, although many of them were very sick, and such had entailed upon them the ordinary sequelæ of rubeola, rendering their convalescence slow and tedious, and making them peculiarly susceptible to disease under the unavoidable exposures of a soldier's life.

The sudden transition of raw recruits in mid-summer from civil to camp life, involving important changes in diet and all the habits of life, together with the exposures incident to such experiences, and the almost irremediable indulgence in the use of green vegetables, which soldiers will obtain, produced their natural effects on the men and gave rise to many cases of diarrhœa, dysentery, &c. The change of location from the cool region of western Massachusetts to the warm latitude of Washington during the most intensely hot days of the season, and the substitution for the pure water of their native hill-sides of the foul, unhealthy water which alone could be obtained during the first fortnight after our arrival, rendered the men specially liable to the above-named affections, cases of which were very numerous, although we were so fortunate as not to lose any men by death.

Our encampment at Kalorama proved to be an unhealthy one. The ground was a hard and sandy soil denuded of grass, thus reflecting the rays of the sun with the utmost intensity, and was bordered wholly on three sides, and partially on the fourth, by dense groves, thus arresting every current of air, and on either side of it ran a small and sluggish stream. The grounds immediately around the encampment had been left in a filthy condition by the previous occupants, and the weather was the most oppressive in point of temperature we had yet experienced, while the regiment had but just arrived from the north. To add to these disease-producing influences, a defect, apparently unavoidable, existed in the commissary department, and the men were compelled to subsist for a period of several days on a diet composed exclusively of salt pork, with a moiety of

salt beef and hard crackers. These combined circumstances served to produce a large number of bowel complaints, and, by debilitating the men, to lay the foundation for fevers during the autumnal months; a result which we then anticipated, and which we have since experienced, though to a less degree than we expected.

Soon after we removed to our present location a season of rainy weather began, which continued from the 13th of August to the 30th of the same month, with very brief intermissions. The temperature was suddenly reduced at the same time, the thermometer marking so low as 56°, which but a few days before stood at 103° in the shade. During this time our men began to perform picket duty, each company remaining out for twenty-four consecutive hours, and returning to sleep on the ground, with no protection but an India-rubber blanket beneath them and a single blanket above them, of course inside their tents. The effect of this exposure was the production of colds, which were soon followed by fevers. The latter were of a bilious remittent type, and some of the cases rapidly assumed a typhoid form. The first cases were of a very severe character, and four of those treated in our regimental hospital have died, and the same number have died at the general hospital. It is proper here to state that most of our sick have been treated in camp. Of those who died here, the first became convalescent and left the hospital for his quarters, but owing to imprudence suffered a relapse, from which he died. The second was violently ill from the first, and was delirious from the earliest stages, his skin literally covered with petechiæ and vibices; he sank after an illness of ten days. The third and fourth had all the phenomena of ordinary typhoid fever, and both died of severe and repeated hæmorrhages from the bowels. As the epidemic progressed the type of the disease became milder, although we still have occasionally cases of a severe character. The treatment which we have employed for the fever has usually been a mild laxative of castor oil and oil of turpentine, often preceded by five grains of blue mass, and full doses of quinine after the operation of the cathartic, with an occasional dose of opium and ipecacuanha.

### *Extract from the Report of* Surgeon THOMAS C. BARKER, 7th Maine Volunteers. *Baltimore, Maryland, quarter ending September* 30, 1861.

One hundred and thirty cases of acute diarrhœa occurred during the quarter. Most of these cases were attended with little or no pain, and the alvine discharges were generally copious and largely composed of mucus, serum, and water. They are probably to be attributed to change of diet, region, and climate, and especially to the use of fruits, such as melons, peaches, &c., which were eaten with avidity by most of the men.

### *Extract from the Report of* Surgeon DAVID LITTLE, 13th New York Volunteers. *Camp near Fort Corcoran, Virginia, quarter ending June* 30, 1861.

It will be observed that diarrhœa and dysentery have been very prevalent, as well as intermittent fever. Several points might be enumerated in explanation of the origin of the first-named diseases, viz: First, the men are raw troops, unused to the hardships and exposures of camp life, and unlearned in the arts that tend to the health and comfort of the soldier, more especially in that of properly preparing their food; second, change of water. Since their arrival in Virginia they have drunk soft water exclusively, whereas they have lived hitherto in a limestone region and are accustomed to hard water. It may, moreover, be mentioned that while at Camp Lincoln, near the Georgetown ferry and at the foot of the hill from Fort Corcoran, the water used was very foul, with exactly what impurity I was unable to determine. At any rate there is a significant fact in this connection, namely, that these intestinal disorders originated here, and so rapid was their progress that, within a week after their first appearance, sixty-four of the men were ill at one time. Immediately upon our removal to our present encampment, Camp Union, situated about one mile and a half beyond Fort Corcoran on the Fairfax road, diarrhœa began to disappear and has been steadily decreasing, so that now only a few mild cases remain.

### *Extract from the Report of* Surgeon N. F. MARSH, 4th Pennsylvania Cavalry. *Washington, D. C., quarter ending December* 31, 1861.

During the past two months the tendency of every disease has been to assume a typhoid character. A simple attack of diarrhœa would in twenty-four hours render a vigorous man perfectly prostrate, as he would then present all the incipient symptoms of typhoid fever. The number of cases of the latter disease was large, and eight of them have terminated fatally.

### *Extract from the Report of* Surgeon WILLIAM FROTHINGHAM, 44th New York Volunteers. *Hall's hill, Virginia, quarter ending December* 31, 1861.

The 44th New York volunteers was recruited mainly by farmers, mechanics, professional men, and students. Nearly all are from the rural districts. This selection, which was supposed to insure against disease, proved in that respect unfortunate. Unaccustomed to hardships, they have suffered more than many inferior regiments. The first week in camp, measles prostrated over a hundred men. About half of these were quartered in a large house, and although they had no beds other than a single blanket, all recovered. Of those treated in quarters and hospital-tents four died with pleuritis and pneumonia. This remarkable difference was probably due to the humidity of the quarters and tents, while the house-floors, though cold, were perfectly dry. The epidemic has left a large number with a condition of system and lungs threatening phthisis, and some already suffer from that disease.

Malaria exerts a powerful influence in the production of dysentery, as well as tedious remittent and intermittent fevers. The tendency to a typhoid condition is strongly marked in pneumonia and dysentery. Typhoid fever is of the gravest character. It is always accompanied with the peculiar diarrhœa; but the rose-colored eruption has been observed in one case only. No autopsy has yet been obtained.

### *Extract from the Report of* Surgeon JAMES C. STUART, 17th New York Volunteers. *Hall's hill, Virginia, quarter ending December* 31, 1861.

The diseases which have been treated during the quarter have in the majority of cases been attributable to miasmatic influences contracted while in camp at Fort Ellsworth. This has been the predisposing cause, while the exciting causes have been exposure, want of cleanliness and care, and, when opportunity offered, excess in eating and drinking. Most of the fevers have been of a bilious-remittent type, with a tendency to typhoid. Perhaps twelve cases of intermittent fever have occurred. Diarrhœas and dysenteries have been frequent, owing usually to exposures and imprudence in eating. These cases have always been easily managed when the patient would do anything for himself in the way of diet. A few cases have become chronic and are still persisting.

### *Extract from the Report of* Assistant Surgeon JOSIAH F. DAY, jr., 10th Maine Volunteers. *Relay House, Maryland, quarter ending December* 31, 1861.

It will be noticed, in looking over the report, that diarrhœas have been somewhat frequent. They were no doubt owing to a change of climate, water, and food. They all gave way to mild remedies, and some of the cases ceased spontaneously.

### *Extract from the Report of* Surgeon ROGER W. PEASE, 10th New York Cavalry. *Havre de Grace, Maryland, quarter ending March* 31, 1862.

The 10th New York cavalry was mustered into service at Elmira, New York, December 25, 1861, and numbered rank and file seven hundred and forty three men. * * * During the time we were at Elmira rubeola prevailed to a great extent, bequeathing to us the various forms of disease that follow it as sequelæ. The regiment was ordered to Gettysburg, Pennsylvania, the last of December, 1861. The quarters provided for us were insufficient for our accommodation, and their crowded condition added many to our sick list.

In the month of January parotitis became epidemic, continuing through February. Nearly all the cases of orchitis during these months were from metastasis of this disease. These cases required but little treatment. During the month of January pneumonia prevailed quite extensively. It arose from colds contracted on the passage from Elmira to Gettysburg, and from the ill-ventilated and crowded quarters in which the men were placed. The case recorded as pneumonia, that resulted in death, assumed a typhoid character, as did many others in which the termination was more fortunate.

It is pertinent to remark here that company B, which suffered greatly from typhoid-pneumonia, arising out of ill-ventilated quarters, was made the most healthy company in the regiment by introducing into their quarters M'Kinnell's ventilator, which consists of a box within a box, or two hollow shafts, the middle one extending below the outer one in the room, and above the outer one where it pierces the roof. Two of these ventilators were placed in the carriage factory occupied as a barrack by this company, after which sickness rapidly diminished among them, until they scarcely reported a case at sick-call. These ventilators were afterward placed in the barracks erected for the regiment, and this, together with careful policing of the camp, gave us unusual exemption from disease of a serious character.

During the month of February we had thirteen cases of remittent fever and seven cases of pneumonia. These were all mild cases, and required but slight medication.

About the first of March orders were received to remove to Perryville, Maryland, and occupy the quarters of the 14th United States infantry. The 7th of March we entered these quarters, and while we found them commodious and in good condition, we learned that the regiment which had just left had suffered severely from typhoid fever and diseases of like character.

The barracks of the 14th were situated on the eastern shore of Chesapeake Bay, in an elevated and pleasant situation. About four hundred yards from the grounds of the 14th were the quarters of the 11th United States infantry. This regiment, I am informed, notwithstanding their contiguity to the 14th, were almost wholly exempt from disease. Dr. Page, the post-surgeon, states that river water was used by both, the camps were equally well policed, and the general management of each equally good. The only solution he was able to give of the difference in sanitary condition was the fact that the ground of the 14th was difficult to drain; that it had been ploughed more recently than the ground occupied by the 11th, and a good sod had not formed on it. With these facts before me it was my object to render the sewerage as complete as possible, to make the barracks thoroughly clean, and to find a new source from which to obtain our supply of water. The sewers were newly opened, and an excellent spring was found convenient to the quarters and yet exempt from its drainage. The weather soon became settled, and the mud, which had heretofore been very deep, disappeared, and to all appearance everything promised well.

About the 10th instant diarrhœa began to prevail. A few days later symptoms of malarious fevers appeared. On the 23th orders came to move over the bay to Havre de Grace. On the 27th numerous cases of remittent fever were developed, while acute diarrhœa had become epidemic. It is safe to say that during the last twelve days we have had a larger number of sick on our list than for the whole month previous. Two of the fever cases have assumed a typhoid type. The diarrhœal cases obstinately resist the ordinary treatment, quinine being essential to a cure in almost every instance. * * *

### *Extract from the Report of* Assistant Surgeon CURTIS J. BELLOWS, 5th Ohio Volunteers. *Camp near Strasburg, Virginia, quarter ending March* 31, 1862.

During most of the quarter the regiment was posted along the line of the Baltimore and Ohio railroad. It has suffered chiefly from catarrh and diarrhœa, with occasional cases of pneumonia and of intermittent fever. Diarrhœa was the

prevalent disease. In obstinacy and severity it has been unequalled by the autumnal diarrhœa seen north of the Ohio river. The discharges were bilious and mucous in character, often bloody. It was restrained only by large doses of opium and acetate of lead. The occurrence of the disease at this season of the year has variously been attributed to diet, water, &c. My own opinion is that the chief causes of its production have been exposure to sudden changes of temperature and the unusual amount of moisture which has attended this season.

### *Extract from the Report of* Assistant Surgeon Henry S. Schell, U. S. A. *Miner's hill, Virginia, quarter ending June* 30, 1862.

The command consisted of company D, 5th United States artillery, 3d and 5th Massachusetts batteries, and the 4th Rhode Island battery. During the early part of the quarter, while before Yorktown, I found that almost every case of diarrhœa and dysentery resulted immediately from eating hard bread fried in grease, after having been soaked in water, making a very palatable and at the same time indigestible meal. The practice was only ended by making it a punishable offence, and with its cessation there was a sudden and decided diminution in the sick report. A large proportion of the cases which occurred later in the season were accompanied by constant nausea, or some other evidence of irritation of the stomach; these were in most cases quickly cured by the frequent administration of minute doses of calomel and opium, or by the exhibition of the subnitrate of bismuth.

### *Extract from the Report of* Assistant Surgeon William R. Ramsey, U. S. A. *Camp near the Chickahominy river, Virginia, quarter ending June* 30, 1862.

With the exception of a slight epidemic of mumps in the early part of April, the diseases of the 11th United States infantry have been during the quarter of miasmatic origin. Cases of remittent and intermittent fevers, and of a diarrhœa which was seemingly produced by the same causes as these fevers, have been numerous. This may be accounted for by the fact that in this notoriously most unhealthy portion of Virginia, the Chickahominy swamps, the men have been much exposed in building bridges over streams and corduroy roads through swamps, after wading all day in water nearly waist deep.

### *Extract from the Report of* Surgeon B. B. Leonard, 84th Ohio Volunteers. *Cumberland, Maryland, June* 30, 1862.

This regiment was mustered in at Camp Chase, Ohio, and arrived at this place June 14th. The troops are encamped on the first terrace west of the city of Cumberland, on the west bank of Will's creek. The health of the troops has been good, with the exception of diarrhœa, which has been very prevalent. This is probably owing to the soft water, the men having been used to hard limestone water. The change of food has also been a contributing cause of intestinal disease.

### *Extract from the Report of* Surgeon Daniel O. Perry, 10th Maine Volunteers. *Camp near Harper's Ferry, Virginia, quarter ending June* 30, 1862.

The water in this region being highly impregnated with lime, caused at first slight diarrhœas, the effect of which was undoubtedly salutary in the end. The cold damp character of the weather during April and the early part of May gave rise to much bronchitis and pneumonia; catarrh was also quite prevalent. It was observable that those who were encamped in tents had much less of these, as well as all other diseases, than those who, while guarding the railroad, were able to use houses as temporary barracks. The month of June found us in the valley of Virginia with marching to do, and many times no covering at night. The weather was warmer than most of the men were used to. On the early appearance of cherries and currants, which were regarded as great luxuries, many of our men indulged extravagantly, and in consequence of this cause and of climatic influences severe diarrhœa and dysentery, as well as typhoid and remittent fevers, prevailed.

### *Extract from the Report of* Assistant Surgeon Edward T. Whittingham, U. S. A. *Camp near Harrison's Landing, Virginia, quarter ending June* 30, 1862.

I found this command, companies G, 2d United States artillery, E, 1st Rhode Island artillery, and B, 1st New Jersey artillery, May 17th, at Cumberland Landing on the Pamunkey river. Since that time we have been constantly exposed to the fatigue of marches, the emanations of the succession of swamps which lay between the above-mentioned place and the point of our extreme advance toward Richmond, and obliged to use water so muddy and impure as to be unfit for drinking. These causes, in combination with the previous exposure of the troops in the marshes about Yorktown, produced a general tendency to malarious fevers and dysenteric affections of the bowels, which are severe in their type and exceedingly unamenable to treatment. Quinia in very large doses, and opium, have been the remedies upon which I have relied. Though the mortality has not been large, the average duration of the cases of sickness has been very long.

### *Extract from the Report of* Surgeon Artemus Chapel, U. S. Volunteers, 1*st division*, 2*d corps*, *army of Virginia, July*, 1862.

An epidemic of diarrhœa broke out in nearly all the regiments during the last ten days of the month, caused principally, I think, by the night exposure to damp cool air and the recent change of tents, commodious and protective ones being replaced by what are miscalled shelter-tents. The disease proved to be mild and easily managed, and it very soon disappeared as an epidemic.

## *Extract from an Inspection Report of the army of Virginia, by* Medical Inspector Edward P. Vollum, U. S. A. *August* 21, 1862.

The troops are sick of the hard bread. They have all been accustomed to soft bread, and they yearn for it cravingly. It could be supplied to them most of the time by having portable ovens in the hands of practical men following close upon the army, and it should be done. Occasionally losses of them would doubtless happen; but this, placed against the satisfaction that would be enjoyed by the men, and the amount of disease that would be prevented by wholesome digestible bread, would not deserve consideration.

Bits of undigested hard bread can be seen in every camp sink, and I have no doubt that its continued use produces some enteric irritation and retards the recovery from diarrhœa and dysentery.

Diarrhœa maintains its place as a prominent camp disease in this army, and furnishes more cases than any other complaint. Quinine, fresh vegetables, and fruits have relieved many cases, and seem to point to a constitutional condition on which the disease may be based. The frying-pan causes the disease frequently, and many cases are attributable to green fruits and imperfectly masticated hard bread. The treatment of diarrhœa varies according to the proclivities of the medical officers; but the plan which receives most favor, and which seems to be most successful, is the administration of medium doses of sulphate of magnesia or Rochelle salt, with a little laudanum or extract of ginger. In many cases of diarrhœa there is a sluggish condition of the liver and an obstruction of the portal circulation; as a consequence the mucous membrane of the intestines is congested, which is relieved by the exosmotic action of the salt.

## *Extract from the Report of* Surgeon Benjamin Lee, 22d New York State Militia. *Harper's Ferry, Virginia, quarter ending August* 31, 1862.*

This regiment having been called out for but three months, the following report covers the whole period of its organization. Three weeks of this time were passed at Camp Monroe, Patterson Park, Baltimore, and the remainder of the time at Harper's Ferry, Virginia.

At Baltimore some difficulty was experienced in procuring the necessary tools for police purposes, while the nature of the soil was such as to make it impossible to construct dry sinks. The sanitary condition of the camp was, therefore, scarcely so satisfactory as could have been desired. A poudrette factory in our immediate neighborhood was occasionally very offensive, but I could not discover that either it or the unfortunate condition of the sinks, which were located at an unusually great distance from the camp, exerted any injurious influence on the health of the men. In fact we could scarcely be said to have a sick list beyond a few cases caused by indiscretion in diet and exposure to the unusually inclement weather. In view of the latter, I took the precaution to have as many fires as possible around the camp at night, especially during cold storms, of which we had many.

Our first encampment at Harper's Ferry was in a comparatively healthy situation, and the sick continued to be few. In a short time, however, the departure of Colonel Mulligan's brigade left the intrenchments without protection, and we were obliged to fall back to take charge of them. Our new ground had been camped on over and over again, and had last been used as a cavalry stable. The Government houses behind the intrenchments, as well as almost all the houses in the villages of Harper's Ferry and Bolivar, were filthy beyond expression, having been occupied as quarters by the troops of both armies for more than a year previous. A vigorous system of police was at once initiated, but we were greatly embarrassed by the difficulty of obtaining wagons. Lime was also scarce and of inferior quality, the inhabitants of the region having entirely suspended their lime-burning operations. I solicited the co-operation of the medical officers of the general hospital in policing the entire town, the civil municipal authorities having ceased to be, and the usual sanitary precautions having therefore been entirely neglected. The altered sanitary condition of our camp soon began to tell, notwithstanding our best efforts. Diarrhœa, assuming in many cases a dysenteric type, although not generally of severe grade, attacked the men by dozens, so that in the course of three weeks, or by the fifteenth of July, more than one-tenth of the regiment were on their backs. The remedy which I found by far the most satisfactory in the treatment of this class of cases, quite at variance with my preconceived opinions, was sulphate of magnesia, followed up by some form of opium, although later in the season I was obliged to prescribe the latter drug with extreme caution in consequence of its torpifying action on the liver. The treatment indicated appeared to exercise a most happy soothing effect on the irritable and inflamed mucous membrane, relieving the tormina and exhausting tenesmus almost immediately on the first evacuation. Castor oil I found acted much less kindly than sulphate of magnesia.

As the intense heat of the latter part of July and August began to make itself felt, deficient action of the liver became common, as attested by the clay-colored deposits which so largely composed the contents of the sinks; by persistent diarrhœas or equally persistent constipation, and in many cases by a remarkable depression of the vital forces, without febrile action, which resisted the combined powers of quinine and stimulants. Nothing but a prompt removal to a northern climate appeared to suffice in such instances to bring up the tone of the system to anything like a working standard. Mercury with chalk I found to be the most efficient agent in stimulating the hepatic secretion and checking the accompanying diarrhœa. Still later, passive congestion of the mucous membrane of the bronchial tubes developed itself, as a consequence of this continued interference with the portal circulation, and the extra amount of labor thrown upon the lungs by the failure of the liver to do its part in decarbonizing the blood, and we had the somewhat singular phenomenon of an epidemic of bronchitis during a period of intense heat, and while the nights were as hot and dry as the days.

As might have been supposed, the best remedy for this condition was to be found not in the use of expectorants, but of the mercurials. Taken in its incipiency, a single dose of blue mass rarely failed to relieve the attack; but if neglected, it became, in some instances, very obstinate. These cases are entered on the report under the head of bronchitis, although the inflammatory element seemed to be almost entirely wanting.

The final manifestation of the hepatic disturbance was jaundice following intense cephalalgia and enteralgia, the latter of such severity as closely to simulate enteritis or even peritonitis.

* This report is published in full, with some additions, in the American Medical Monthly, October, 1862, p. 241.

The natural advantages of our situation were great. The camp was pitched upon a steep hill-side, some two or three hundred feet above the rocky bed of the Shenandoah. The soil was hard and slaty, affording a perfect surface drainage. The company streets were kept scrupulously clean, and when at length we obtained wagons for our own use, the outer limits of the camp were also in good condition. Up to that time it was a very difficult matter to police them thoroughly. The exposure was southwesterly, looking directly up the valley of the Shenandoah.

Until the middle of August the nights were hot and there was little dew. After that time they became very cold and damp, the change being extremely abrupt, and the malaria which prevails in all this valley began to make itself felt, notwithstanding the apparently favorable conditions of our location. This was manifested not by regular attacks of chills and fever, but rather under the masked form of the disease, perhaps owing to the fact that most of the men had used quinine more or less freely as a prophylactic, an unaccountable lassitude and malaise, a feeling of dulness about the head, and vertigo, persistent headache, rarely rigors, not unfrequently fever without the chill, and in two singular cases a well-marked intermittent torticollis.

One single case of typhoid fever occurred, which terminated favorably.

The use of an unaccustomed water containing a small amount of lime undoubtedly aggravated the intestinal fluxes as well as gave rise to a great deal of colic. Nothing appeared to act so well in these latter annoying cases as capsicum combined with camphor, opium being in great measure contra-indicated by the tendency to hepatic congestion.

The remittent fever, which prevailed to a slight extent, was of a mild form, rarely lasting more than a week, but sometimes leaving the patient's strength prostrated for a much greater length of time.

The 12th regiment New York State militia was encamped within a quarter of a mile of our own ground. Its members were subjected to precisely the same characteristic influences; yet its sick list, while it presented precisely the same variations as our own, was never as large by one-fourth. The two regiments were about equal in numbers. I attribute this difference to four causes: First, to the classes of men composing the two regiments, the twelfth being made up of the ordinary material of volunteer regiments, while our own was composed of merchants, professional men, and clerks, a class wholly unused to the labor, privations, and exposure to which they were necessarily subjected. Second, to the fact that the twelfth occupied Sibley tents, while the twenty-second was almost entirely supplied with the wedge-tent. The former could easily be furled daily, and thus the most perfect ventilation of the ground secured, while the latter must be entirely struck in order to effect the same result, which could never be accomplished oftener than twice a week, rarely so often. Third, to the saturation of the soil on which we were encamped with the emanations, excretions, and offal of regiments which had preceded us for many months previously. Fourth, to our more immediate proximity to the foul houses of the village.

I have but one death to report, that of our Colonel, James Monroe, formerly of the 6th United States infantry, a man who possessed in an eminent degree the affection and confidence of his command. [Case 95*.] While the regiment was in Baltimore Colonel Monroe was seized with a congestive chill, which left him greatly prostrated. Fearful of a recurrence, which physicians in Baltimore thought might prove fatal, he remained in that city for a period of fifteen days after the departure of the regiment for Harper's Ferry. Anxiety for the safety and welfare of his command led him to follow us while still much debilitated. During the first fortnight he did not seem to lose strength, but his nervous system was in a most unsatisfactory and excitable condition. At the end of this time he was attacked with mild febrile symptoms, which gradually abated, but which determined me to send him north as soon as he should sufficiently recover to make the journey. On the afternoon of July 29th, however, after a natural though somewhat profuse evacuation from the bowels, he was seized with excruciating pain in the abdomen and in the region of the anus, so severe as to cause syncope. I immediately administered opium in full doses, both by the mouth and rectum, with the effect of moderating the pain, but not of reducing the frequency of the pulse, which was weak and about 120. During the next day his condition was not materially altered. I administered in the morning ten grains of calomel, followed later in the day by sulphate of magnesia with capsicum, but did not succeed in procuring an evacuation. The pains became again very violent, not yielding to anodynes, and so continued until toward midnight of the 30th, when they ceased entirely, and vomiting of bilious matter supervened, with hiccough and eructation. The pulse rose in frequency and lost in force, the skin became cold and covered with a profuse perspiration. Carbonate of ammonia and whiskey, administered in very large doses, both by the mouth and by enema, artificial heat and stimulating frictions, failed to induce the slightest reaction. The nervous jactitation became more and more distressing, and he finally succumbed at 6 p. m., July 31st, shortly after rising to have a liquid stool.

The short duration of the attack, the sudden onset of the pain and its agonizing character, the great prostration and nervous anxiety, and the fatal result in thirty-six hours after the invasion, appeared to me to point to peritonitis, probably the result of a perforation of the intestine; but as I was unable to obtain an autopsy the diagnosis must remain conjectural.

## *Extract from the Report of* Surgeon John W. Foye, 11th Massachusetts Volunteers. *Army of the Potomac, quarter ending September* 30, 1862.

This regiment reached Harrison's Landing on the 2d of July, 1862, and on the 5th went into camp about five miles from the landing. The prevalent disease was diarrhœa of a peculiar and exhaustive character, marked by such a uniformity of symptoms that a single case will be a sufficient example of the general character of the disease. The patient presents himself at sick-call complaining of a general feeling of malaise. An examination of the tongue exhibits a yellow coating more or less thick, according to the length of time since he was first attacked. There is a slight headache, more or less pain in the back, and in most cases nausea; the latter symptom occurring when the desire to stool is urgent, and at once relieved by a discharge from the bowels. The discharges are profuse, of a thin watery character, unattended with pain, and often as many as fifteen a day. In those cases in which the disease has existed four or five days or upwards there is great emaciation. The yellowness of the

* This case belongs to the chapter on fevers, but is given here so as not to separate it from the rest of Surgeon Lee's report.

skin which generally characterized this disease rendered the inference irresistible that it was of miasmatic origin, and it was probably contracted during our stay in the swamps of the Chickahominy. Various forms of treatment were instituted, but that found most efficacious was the exhibition of a mercurial at night, usually a blue pill, followed by full doses of quinine through the day, the patient being restricted during treatment to a strictly farinaceous diet.

### *Extract from the Report of* Surgeon STEPHEN ROGERS, 7th New York State Militia. *Baltimore, Maryland, quarter ending September* 30, 1862.

A fruitful cause of the bowel diseases which continued till nearly the end of August was the inadequate provision of privies, forcing the members of the command to wait their turn at the sinks for, in many cases, an hour or two. This continually resulted in failing to secure the daily and regular alvine evacuation, and was thus the cause of torpidity, constipation, and diarrhœa.

### *Extract from the Report of* Surgeon GEORGE W. MARTIN, 4th Maine Volunteers. *Camp near White's Ford, Maryland, quarter ending September* 30, 1862.

When I joined the 4th Maine at Harrison's Landing I found a large number on the sick report suffering from diarrhœa, which had a strong tendency in many cases to assume a typhoid form. The causes of this appeared to be the fatiguing marches on the Peninsula, the severe labor and exposure in the Chickahominy swamps, the rations deficient in vegetables, and improperly cooked, the water, which was often obtained from stagnant pools abounding in decayed vegetable matters, and the debilitating effects of a southern climate. The treatment found most beneficial in a majority of cases consisted in the use of tonics (iron and quinine) and stimulants, preceded by a mercurial cathartic. At present the principal cause of diarrhœa in camp is the irregular manner in which the soldiers cook and eat their food. Some of them eat five or six fried dishes, or more properly messes, during the day. There is always an increased amount of diarrhœa after beans are issued to the men, especially in hot weather. I have noticed that cases of diarrhœa of several days' standing have been entirely cured on a march, and without medicine, when the soldier could get only hard bread and raw pork, with scanty time for three meals a day.

### *Extract from the Report of* Surgeon J. THEODORE CALHOUN, 74th New York Volunteers. *Camp near Alexandria, Virginia, September* 30, 1862.

The 74th New York was sent to Washington, D. C., in the latter part of July, 1861, and went into camp near Good Hope, on the Maryland side of the Eastern Branch. October 15th, the organization was mustered into the service of the United States, and shortly after moved to a camp in southern Maryland, near Port Tobacco. While here a large proportion of the men were sick, intermittent and remittent fevers being common, and typhoid fever not unfrequent. In December the regiment moved to Liverpool Point, on the Potomac river, where they remained till spring. They occupied tents until some time in February, when they moved into rude log barracks which they had built. The sick list was large. We had an epidemic of measles, and a number of cases of typhoid fever, three of whom died. Coughs, colds, and rheumatism were unusually prevalent; there was also a good deal of diarrhœa, which at times appeared to be due to the use of the water of the Potomac river for drinking purposes.

During the first week of April, 1862, the regiment embarked for the Peninsula, landed at Ship Point, and took part in the operations before Yorktown. May 5th, we were engaged in the battle of Williamsburg, and had thirty-nine killed and one hundred and ten wounded out of a force of five hundred men. We were also engaged at Fair Oaks, June 1st. Shortly after this a peculiar form of fever presented itself, characterized by an extremely weak pulse, great prostration, suffused eyes, vertigo, and anorexia. Its duration was generally from four to five days. The treatment employed was usually a mercurial cathartic, followed by ten grains of quinine three times a day. On the 27th of June the regiment participated in the battle of Old Tavern, losing two killed and about thirty-five wounded. Subsequently we took part in the battles of Peach Orchard, Savage Station, and Malvern Hill, losing about twenty in killed and wounded. During all this time diarrhœa and dysentery have been the most common complaints, and it may not be improper to observe that they always increased in proportion as the men were crowded together, while fresh provisions invariably cut down the sick list.

After the regiment went into camp near Harrison's Landing, the men being in Sibley tents, we had a model camp in every respect. Every attention was paid to the observance of proper hygienic rules, yet, despite of all, we continued to have an unusual amount of sickness, especially diarrhœa and dysentery. The bowel affections yielded readily to treatment, yet they were continually recurring. Two deaths occurred: one from sunstroke, the other from an attack of cholera morbus (produced by eating canned lobster) supervening on dysentery. These were the only deaths from disease while on the Peninsula.

Leaving Harrison's Landing about the middle of August, the regiment marched to Yorktown. No sooner had the men reached the corn-fields than they fed greedily upon the green corn, eating immoderately of it; yet diarrhœa ceased as if by magic. Before leaving camp every one was more or less troubled with it. One day out of camp, living on green corn and unripe apples, and bowel affections disappeared. I witnessed this effect in my own person. The change from a crowded camp ground to the fresh country air probably was not without its influence.

### *Extract from a Report by the same, to* Medical Inspector EDWARD P. VOLLUM, U. S. A. *Army of the Potomac, October* 10, 1862.

The 74th New York spent the winter of 1861–'62 in camp and on picket duty along the Maryland shore of the Potomac, and during the following spring and summer took part in the operations of the army of the Potomac on the Peninsula and in Virginia and Maryland. Perhaps the disease which was most frequent during all this time was camp diarrhœa or dysentery.

The causes of it are very varied. That which must rank first is crowding men together. Whenever we have been camped by ourselves, camp diarrhœa has been almost absent; crowd regiments all around us, and our sick list is full. At Yorktown and Harrison's Landing, where the army was camped together, camp diarrhœa was unusually prevalent. Bad or poor diet, salt meat in excess, with a want of fresh provisions in sufficient quantity, have also acted as causes. At Harrison's Landing camp diarrhœa affected nearly every one. On our retreat from there to Yorktown the men subsisted almost entirely upon green corn, of which they ate immoderately, and fruits, many of them unripe, yet diarrhœa ceased as if by magic, and did not recommence until we came back to the salt meat diet. The food is too frequently improperly cooked. Badly kept sinks also produce diarrhœa. A well man will, I believe, sometimes get diarrhœa by sitting upon sinks used by patients affected with that disease. Disinfectants, the best of which I think is Cormes's coal-tar and gypsum, (carbolic acid,) are useful where they can be obtained. Impure water loaded with organic matter, changes of temperature, malaria, and the impure gases generated on battle fields, also act as causes.

### *Extract from the Report of* Assistant Surgeon W. F. Tibbals, 5th Ohio Volunteers. *Harper's Ferry, Virginia, quarter ending September* 30, 1862.

During the month of July the 5th Ohio was stationed at Alexandria, Virginia, for the purpose of recruiting. The camp was situated upon the first heights from the Potomac. Police regulations were strictly enforced, and the diet was much better than we ordinarily received. The water was from springs, and we suffered only from diarrhœa, constipation, and catarrh. About the first of August we took the field under General Pope. Our campaign upon the Rappahannock lasted during the month of August, and was one of continual exposure. A number of the men had neither shelter-tents nor blankets. The diet was principally hard bread and coffee; beans and rice were never issued, meat not over four days in the week. Diarrhœa raged to an alarming extent, and was almost universally of a bilious character. I attribute it entirely to the diet. The next most frequent disease was rheumatism, incident to the exposure. During our campaign in Maryland the number of cases of diarrhœa increased, and ordinary prescriptions had no effect whatever. Since our arrival in this camp we have secured a more nutritious diet, and the number of patients with diarrhœa has decreased.

### *Extract from the Report of* Surgeon Samuel F. Forbes, 67th Ohio Volunteers. *Camp near Suffolk, Virginia, quarter ending September* 30, 1862.

One fact in respect to the diarrhœas deserves to be mentioned, namely, that when the 67th Ohio advanced toward Malvern Hill and the men got green corn, new potatoes, and other vegetables, and consumed large quantities of them, their diarrhœas were either entirely cured or greatly benefited. This fact, of which there need be no doubt, for my opportunities of judging were both numerous and excellent, corresponds with the views I have always held since I entered the service, that more vegetable food should be supplied to the troops.

### *Extract from the Report of* Assistant Surgeon Charles S. Wood, 66th New York Volunteers. *Bolivar Heights, Virginia, quarter ending September* 30, 1862.

I joined the 66th New York at Warrenton Junction in March last. There the prevailing diseases were severe colds, diarrhœa, and rheumatism. After we reached Ship Point, on the Peninsula, the same diseases prevailed in an increased degree. At Cheeseman's Landing many cases of bilious remittent fever occurred, and diarrhœa, which became still more common, often passed into dysentery. About April 15th we arrived before Yorktown. Here diarrhœa continued to be the principal complaint, and it was noticed that an increased number of cases always reported the day after beans were served. Moreover, evidences of malarial influence were observed in nearly all the cases, and a combination of quinine and rhubarb was found to be the most efficient mode of treating the disease. We had also many cases of intermittent and of typhoid fever. The latter disease was of shorter duration than ordinary enteric fever, and the rose-colored spots were seldom observed. Quinine was found essential in the treatment. Most of the cases recovered in from ten days to two weeks, but some persisted and were sent to northern hospitals, where many of them remained three or four months before they fully recovered. At Cold Harbor this form of fever became more frequent as well as more severe, and nearly all the men had more or less diarrhœa. The fever cases often began suddenly with a raging delirium, which lasted from five to twelve days and then generally subsided. In other instances delirium did not set in until the fever had lasted some days, and these were the most troublesome cases. The treatment found most efficient was quinine, given in five-grain doses every four hours. Many of these cases had recovered before we reached Fair Oaks, others were sent to the rear, and several died.

At Fair Oaks the disease became still more virulent. Delirium was usually the first symptom, followed immediately by hot, dry skin, tongue red at the edges, creamy on the surface, pulse 100 to 120. Cramps in the extremities were common, and diarrhœa became troublesome and was accompanied by tympanites. Brandy and quinine, the latter in ten-grain doses every four hours, were found to be the most reliable agents in the treatment. Most of the cases were convalescent by the twelfth day, and returned to duty by the end of the third week. About this time also scurvy manifested itself in an unmistakable manner, and during the month of June nearly half our men showed symptoms of it. Fresh vegetables were asked for, but owing to the difficulty of transporting them the quantity obtained was too small to prove efficient. A reasonable supply of lemons was obtained, however, and soon effected the desired result. About the same time an infusion of white-oak bark (*quercus alba*) was prescribed to our diarrhœa cases with excellent results. Both fevers and diarrhœas began to subside when we reached Harrison's Landing, and showed a wonderful improvement after we reached Alexandria in the latter part of August.

## *Extract from the Report of* Surgeon De Witt C. Hough, 7th New Jersey Volunteers. *Alexandria, Virginia, October* 1, 1862.

The 7th New Jersey reached Harrison's Landing July 2, 1862, and encamped on elevated ground, in a dense wood with a thick growth of underbrush, requiring much labor to make the ground habitable, after which it was tolerably healthy, though the want of a sufficiency of good water was severely felt. The men on arrival were much worn out by their previous labors and privations. The prevailing complaints were those arising from exhaustion, especially diarrhœa, and some intermittent fever. While here we obtained a hospital tent, abundant supplies of medicines, sanitary articles, ice, lemons, &c.

In diarrhœa I found much benefit from acetate of lead and opium in divided doses, also from decoctions of the *liquidambar styraciflua* and of the root of *rubus villosus*, which were used with much advantage in the more recent cases. Farinaceous diet and perfect rest were essential to recovery.

## *Extract from the Report of* Surgeon Alexander J. McKelway, 8th New Jersey Volunteers. *Camp near Alexandria, Virginia, October* 15, 1862.

The 8th regiment of New Jersey volunteers was mustered into the service of the United States at Trenton, New Jersey, August 29, 1861. It remained in that vicinity until October 1st, receiving recruits until it numbered about nine hundred men. We arrived at Washington, D. C., October 2d, and encamped on the evening of the same day on Meridian Hill, where we remained until December 1st. The camp-site was all that could be desired for elevation, purity of air, and facility for drainage, and yet, from changes in their habits of life and difference of water and climate, the men suffered severely from diarrhœa. Several cases of dysentery of grave character occurred, also typhoid fever to some extent, together with three cases of variola.

It seems worthy of note that quinine, combined with the astringents and mercurials, given in diarrhœa or dysentery, was thought to be beneficial in some cases of an obstinate character. In this connection, it may be remarked that during the month of October the weather was unusually warm, and to those who, in a more northern latitude, had never at that season of the year been subjected to such a degree of heat, very oppressive; also that malaria had much to do in producing the obstinacy of those cases of disease which have been referred to.

November 30, 1861, we moved to Budd's Ferry, Maryland, landing at the mouth of Mattawoman creek, and on the third day after encamped in a pine forest, which was our resting-place for the winter. The soil of the camp was a sandy loam, with tough clay subsoil, retaining water in large quantities, while between the encampment and the Potomac river a large marsh intervened. During the month of December acute and chronic rheumatism and diarrhœa were the prevalent diseases, induced by exposure on picket duty, which had to be continued during the entire winter.

During the latter part of the month of February and through the month of March rubeola prevailed in the regiment to the extent of about thirty cases. Although the disease was of a severe type, yet none of the cases died, but some of them were followed by tuberculosis and bronchitis, which caused the discharge of several men. During these months typhoid fever and typhoid-pneumonia prevailed to a considerable extent, and were of a grave and severe type. Four deaths occurred from these last-mentioned forms of disease.

As the weather became warmer the effect of malaria became visible in the prevalence of intermittent and remittent fevers, which, however, yielded readily to treatment. On April 5th we embarked for the Peninsula, leaving thirty-five men in the hospital of Hooker's division at Budd's Ferry. To this hospital there were sent from this regiment, as well as from the whole division, many debilitated from the effects of rubeola and typhoid disease, many afflicted with intermittent, remittent, and typhoid fevers, the victims of chronic rheumatism, and those who were broken down and infirm, numbering in all five hundred and twenty men from a division of fourteen thousand. The passage occupied seven days. The men, crowded on transports, suffered much from the inclemency of the weather and from the bad quality of the water furnished them. Diarrhœa made its appearance in a large number of cases previous to landing on the 12th of April at Ship Point, Virginia, from whence the regiment next day marched to Yorktown. Here the encampment was crowded in consequence of the large number of troops occupying the ground. Water was procured with difficulty, owing to its great depth from the surface; constant exposure on duty taxing the energies of the men to the utmost, digging trenches amid rain and storm, and the performance of picket duty, told with fearful effect upon their health. Men never worked harder than they did from the time of their landing until May 4th. Diarrhœa, camp dysentery, remittent and intermittent fevers, as well as typhoid fever of grave type, made their appearance. The sick list averaged from one hundred to one hundred and twenty daily. There were two deaths from dysentery and one from typhoid fever. More than sixty men were sent to general hospital. On landing at Yorktown the command had numbered eight hundred and forty-five men.

May 4th, the regiment took up its line of march for Williamsburg. The roads were horrible, the mud being knee deep, and the march, which was continued until 12 o'clock p. m., was resumed at 4 o'clock on the morning of the 5th. This was severely felt by men who had eaten nothing since the previous day, and who had lain in the mud during the four hours allowed them for rest. Without breakfast they were brought into action, and did their part faithfully during seven hours.

The mean strength of the regiment in this action was six hundred all told, and its loss was one commissioned officer killed, eleven wounded; enlisted men, thirty-four killed, one hundred and fifty-eight wounded—total, two hundred and seven. As soon as the wounded were attended to (no amputations being necessary) they were shipped to various hospitals from Briar Creek Landing.

The regiment encamped near the battle-field until May 11th. The long-continued rains had rendered the site of the camp almost a marsh, and the diseases which had prevailed at Yorktown were aggravated in frequency and intensity. On the 11th the march was resumed. The regiment remained for three days at Burnsville, and then advanced, passing by Slatersville, New Kent Court-House, Cumberland, and Baltimore Cross Roads, to Bottom's Bridge. This march to Fair Oaks, which was reached on May 26th, was performed amid a constant rain-storm and over roads rendered almost impassable by mud.

Dysentery, diarrhœa, intermittent and remittent fevers were the attendants of the regiment, and many cases of these diseases were sent to the transports at West Point. On the 31st this regiment, together with the 7th New Jersey, was detailed to guard the railroad bridge, rifle-pits, &c., near Bottom's Bridge, the remainder of the brigade being engaged in the battle of Fair Oaks. The aggregate strength of the regiment here was about four hundred men. In a few days the regiment rejoined the division at Fair Oaks and did duty in the advance. The duty was harassing and exhausting: on picket one day, and at work on fortifications and in trenches knee-deep in water the next. The enemy was close in front and the firing between the pickets constant, preventing the men from securing necessary repose The encampment was a perfect graveyard. Within the lines the dead were unburied, lying on the surface of the ground with but a sprinkling of earth thrown on them, while immediately without the dead bodies of men and horses were quite exposed or but slightly covered with brush. Just outside of the camp the bodies of thirty dead rebels were one day counted by an officer of this regiment, whose attention was directed to their place of sepulchre by their feet projecting from beneath the brush thrown over them. Here the suffering of the men from the want of water suitable for drinking was terrible. Efforts to dig wells (one forty-five feet deep was dug) only resulted in procuring water still more unfit for use than that nearer the surface. The air was filled with a most horrible stench, arising from the putrefaction of dead bodies on every side. As might be expected from such a combination of evils, the health of the men rapidly deteriorated. Fevers of the types before prevalent increased in intensity and numbers; diarrhœa and dysentery became more rife; and several cases of *coup de soleil* occurred, occasioned by exposure to the sun's rays during the intense heat of that period.

The regiment remained at Fair Oaks four weeks, during which time from seventy-five to one hundred men were lost to it by sickness and death. One commissioned officer and two privates were killed on picket duty, and ten privates wounded. Every few days a number of broken-down and diseased men were sent to general hospital at White House, where six of them died. The health among the survivors of those sent to hospital was, in a large number of instances, so seriously impaired as to render them totally unfit for duty, while the seeds of disease planted in the swamps of the Chickahominy developed themselves among those remaining with the regiment for weeks afterward.

On Saturday, June 28th, the order was given for the army to retreat. On that day this regiment was on picket duty, and remained where it was till noon of the 29th, when it commenced gradually retiring in order along the Charles City road until it reached the cross roads of the same name, some fifteen or eighteen miles from Fair Oaks, the rear guard constantly skirmishing with the enemy. During the seven days' fight, while the army continued its retreat, this regiment, though equally exposed with the rest, sustained no casualties. Some thirty-five men belonging to it, who were left in the hospitals at Savage Station, Bottom's Bridge, and White House, were taken prisoners by the enemy. July 3d, the army reached Harrison's Landing.

### *Extract from a Report by the same, to* Medical Inspector Edward P. Vollum, U. S. A. *Army of the Potomac, October* 20, 1862.

* * * By the time the 8th New Jersey reached Harrison's Landing, it was reduced to less than three hundred men. Scurvy had made its appearance, and manifested itself with more or less intensity in almost every man. Many of the cases of diarrhœa and dysentery had now become chronic. Every form of mercurial and astringent was used, with but little effect. The disease might appear checked, but the improvement of to-day was lost on the morrow, and it was only when large and frequent doses of quinine were given that any control was exercised over an evil which seemed at one time to be beyond remedy. The effect of this remedy indicates the influence of miasma in the production of the disease. The symptoms appeared to be aggravated by the use of hard bread, fragments of which were passed undigested by the sick.

### *Extract from the Report of* Surgeon William R. Blakeslee, 115th Pennsylvania Volunteers. *Camp near Alexandria, Virginia, October* 20, 1862.

June 26, 1862, the 115th Pennsylvania left Camp Curtin, Pennsylvania, for Fortress Monroe, Virginia, arriving there June 28th. July 6th, we took passage by steamboat for Harrison's Landing, where we encamped July 9th, and remained till the middle of August.

The prevailing disease while on the Peninsula was acute diarrhœa. There were also some three or four cases of typhoid fever, six of common continued fever, six of rheumatism, five of colic, and some other cases of disease which I cannot specify on account of the loss of our records. The cases of diarrhœa numbered about two hundred.

This disease in many instances yielded readily to the following prescription, which seems to be especially applicable to the diarrhœa of irritation. R. Dilute sulphuric acid two fluid drachms, compound tincture of cardamom three fluid drachms, white sugar half an ounce, mint-water six fluid ounces. Take two tablespoonsful every hour or two. In the cases attended with much pain the mixture was preceded by a grain of opium. When the compound tincture of cardamom was not accessible, I substituted the compound spirits of lavender with good effect, the cardamom tincture, however, being preferable.

Creasote is another remedy for diarrhœa from which I have found much benefit, and particularly in cases attended with offensive discharges, and combined with chalk mixture, which forms an excellent adjunct in cases attended with acidity. R. Chalk mixture four fluid ounces, creasote eight drops, laudanum two fluid drachms. Take a tablespoonful every hour or two. When the stools are alarmingly copious, the addition of ten grains of tannic acid will mitigate and often completely subdue the malady. Whiskey and quinine were administered as a prophylactic with apparent benefit.

### *Extract from the Report of* Surgeon Harvey E. Brown, 70th New York Volunteers, *to* Medical Inspector Edward P. Vollum, U. S. A. *Army of the Potomac, October* 20, 1862.

In April, 1862, the 70th New York was moved on transports to Ship Point, Virginia, and from that point marched to take its part in the siege of Yorktown. Here the health of the regiment continued good in the main, although a number of cases of

subacute rheumatism appeared, the result evidently of exposure to the weather in the trenches. The usual amount of camp diarrhœa and dysentery also prevailed, due I think, both here and previously while we were in southern Maryland, to over indulgence in the pies, cakes, &c., obtained at the sutler's. Those who did not trade with the sutler were not thus attacked.

* * June 27th, we encamped on the battle-field of the Seven Pines, surrounded by the graves of those who fell in that action; living in an atmosphere impregnated with the most horrible effluvia; drinking water dug from but three or four feet below the surface; with extremely insufficient supplies; obliged to do twenty-four hours' picket duty out of every seventy-two, and on the intervening days to work in the trenches. Under these circumstances it is not to be wondered that the men got sick. More than half the regiment was constantly on the sick report, chiefly with subacute rheumatism and camp dysentery. This latter disease I found much more difficult to manage than hitherto. The ordinary remedies utterly failed to produce any good effect, and the only satisfactory result was obtained from the use of mercury with chalk, quinine, and Dover's powder, as in the following formula: R. Mercury with chalk five grains, quinine three grains, Dover's powder seven grains. Take at intervals of from two to four hours. This treatment, with rest and light diet, generally relieved the disease, if taken in the beginning, in a few days.

## *Extract from the Report of* Assistant Surgeon Walter B. Morrison, 3d Michigan Volunteers, *to* Medical Inspector Edward P. Vollum, U. S. A. *Army of the Potomac, October* 25, 1862.

The 3d Michigan was mustered in June 10, 1861, at Grand Rapids, Michigan; took part in the first movement to Bull Run, and has since accompanied the army of the Potomac. We suffered from an epidemic of measles while at Grand Rapids, and since we joined the army of the Potomac the prevailing diseases have been malarial fevers, diarrhœa, and dysentery. The last two affections were attributed, during the early part of our service, to change of climate, habits, mode of life, &c. At a later period, while on the Peninsula between the York and James rivers, Virginia, the diarrhœas were generally of a scorbutic character, as was proved to be the case by the prompt relief afforded by extra issues of vegetables and vegetable acids.

## *Extract from the Report of* Assistant Surgeon Charles E. Cady, 138th Pennsylvania Volunteers. *Relay House, Maryland, October* 31, 1862.

It will be observed, in the accompanying report of the 138th regiment of Pennsylvania volunteers for the month of October, 1862, that diarrhœa and typhoid fever have been the prevailing diseases. In their general characters the diarrhœas were such as are usually met with among those who have experienced changes in air, diet, and mode of life. Copious watery stools, slight fever, nausea, loss of appetite, red scanty urine, vertigo, slight abdominal pain, indigestion, flatulence, &c., were the prominent symptoms. The general plan of treatment adopted consisted in the use of free doses of opium combined with calomel or acetate of lead; but quinine and brandy often succeeded when other modes of treatment failed.

In regard to typhoid fever, many of our cases were of the most aggravated character. The invasion of the disease was often most rapid and prostrating. In several of the cases the men performed duty the day before reporting themselves ill, and upon the third or fourth day after, all the peculiar symptoms of the disease would be well-marked.

Our mortality has been low, considering the number of cases treated; as low, indeed, as is usual in private practice. The treatment adopted was that most in vogue in the Pennsylvania hospital, Philadelphia, viz: treatment of symptoms as they arise. Good, full, and easily digested diet, milk and brandy in punch, eggs, Dover's powder, castor oil, sinapisms, neutral mixture, &c. The camp has been rigidly policed daily; the sinks deep and well hidden; cooking utensils well cleaned after use; food well cooked. The water used is of most excellent quality, slightly impregnated with iron. The general temperature of the air during the month has been high, and the weather dry, with westerly winds. The camp is located on a high ridge of land on the north bank of the Patapsco, ground dry and hard, no shade. The food used by the men has been of a good quality. I have been inclined to attribute many of the cases of diarrhœa to the use of pastry of various kinds sold by the sutler, although frequent cases occurred in those who used nothing of the kind. The cases of respiratory disease were of a mild although well-marked character, yielding in a few days to rest and ordinary antiphlogistic treatment.

## *Extract from the Report of* Surgeon William H. White, U. S. Volunteers, on duty with the 4th Pennsylvania Cavalry. *Potomac Creek Bridge, December* 31, 1862.

The prevailing disease in the 4th Pennsylvania cavalry is diarrhœa. There is nothing in the climate or locality to cause it. It is due, I believe, to a lack of vegetable diet and the bad quality of the coffee, which doubtless is adulterated. The disease is readily controlled by opiates, but returns on the suspension of the remedy, as the cause is persistent.

## *Memorandum from the case-book of* Surgeon William O. McDonald, 27th Connecticut Volunteers. *Army of the Potomac, April*, 1863.

The cases of acute diarrhœa in the 27th Connecticut have usually been transient, and seemed best managed by a purge of blue mass, Epsom salts, or castor oil and laudanum, followed by light diet, and a small dose of opium after each passage. Many of the chronic cases, dating from as far back as the battle of Fredericksburg, December, 1862, would at times be much better, then worse again. Confirmed cases were worse after exercise or exposure on picket duty. Often they seemed to become used to the discharge, and its stoppage caused distress in the belly or rheumatic muscular pains. The passages as a rule were rather numerous, anywhere from four to twelve in the twenty-four hours; they were generally watery and light in color. The tongue was moist and clean, except when the general system became much affected, when it would be thinly furred or glazed. The

emaciation was not always very great, nor was the patient always much weakened; but the face invariably bore the impress of the disease. The abdomen was generally shrunken, and invariably tender in the umbilical region. The tenderness sometimes extended along the whole course of the colon, over the stomach, and into the hypogastrium; but the transverse colon was always tender. In one or two cases the spleen was sensitive to pressure. More or less pain ordinarily preceded the passages from the bowels. The urinary bladder was never sympathetically irritated. The appetite was craving, at times entirely beyond the patient's control, and in old cases it seemed to make but little difference what was eaten; that is, they were apparently no worse for indulgence. The liver was at times involved, jaundice supervening. These were the more obstinate cases, but were comparatively rare.

In the treatment of obstinate cases the use of iron has given the most satisfactory results, and the tincture of the chloride is probably the best form. It was administered in the dose of ten to fifteen drops, combined with an equal quantity of tincture of opium, three times daily. The recumbent position was insisted upon in bad cases, and no vegetables were allowed except potatoes and roasted apples; beef-tea, steak, &c., were given freely, unless specially contraindicated.

We have had but few cases, less than half a dozen, of dysentery, and these have been mild. The bloody discharges continued in no case over fifty hours. The bladder was not affected to any extent in these cases. Two ounces of salts given at once, as soon as the disease had manifested itself, would always render its subsequent cure easy. The salts caused frequent watery passages, and opium and abstinence rapidly caused these to cease.

### *Extract from the Report of* Surgeon Francis C. Reamer, 143d Pennsylvania Volunteers. *Camp near Fort Slocum, D. C., quarter ending December* 31, 1863.

The 143d Pennsylvania was recruited in Luzerne county, Pennsylvania, and was mustered into service early in October, 1862. During the months of October and November, while still in camp in Luzerne county, an unusual number of cases of dyspepsia and diarrhœa were treated, which could be justly attributed to the new mode of living and the free use of indigestible food, such as badly baked pies, cakes, unripe fruit, and of fermented and alcoholic liquors. During the latter part of November we came to this place.

### *Extract from the Report of* Surgeon William H. Thayer, 14th New Hampshire Volunteers, *to* Medical Inspector George W. Stipp, U. S. A. *Department of the Gulf, May* 4, 1864.

From November 1, 1862, to May 3, 1863, the 14th New Hampshire was on guard and picket duty in Maryland, along the Potomac from Edward's Ferry to Great Falls; subsequently, until January, 1864, it was on provost duty in and about Washington, D. C. During February it returned to Concord, New Hampshire, where it was furloughed, and subsequently went to New York, and thence by steamer to New Orleans, where we arrived April 12th.

During the six months we were in Maryland typhoid and typho-malarial fevers were very prevalent. We had also an epidemic of measles, and one of mumps. After we arrived in Washington the regiment enjoyed good health until midsummer, when the men began to suffer very much with diarrhœa, produced, as I believe, by the unwholesome atmosphere of the prisons where they were on duty as guards. Indeed diarrhœa has always been present in the regiment. During the first winter it was noticed that, besides the cases under treatment, a very large proportion of the officers and men on duty and otherwise well had habitually very loose dejections. In spite of this, all who were not seriously sick gained flesh very noticeably, from ten to fifteen pounds, during the winter.

### *Extract from the Report of* Surgeon D. Wadsworth Wainwright, 4th New York Volunteers. *Havre de Grace, Maryland, quarter ending September* 30, 1861.

The 4th New York was stationed at Newport News, near Fortress Monroe, Virginia, from June 7th to July 20th. During this time the great majority of the sick were cases of acute diarrhœa and dysentery, of a mild type, yielding readily to treatment. The treatment, however, had to be changed at different times from calomel and opium to acetate of lead and opium, and afterward to castor oil and laudanum, for the reason that the other plans failed.

Some cases were peculiar in their nature; for instance, a man reported sick, with no marked symptoms of fever or great general or local derangement, still would waste away very rapidly, (one man lost twenty-five pounds in five days,) and pass quickly into a low typhoid state, evidently due to malarious influence. We had also a number of cases of chronic cephalalgia of malarious character, to which quinine gave the only relief.

### *Extract from the Report of* Surgeon David Minis, jr., 48th Pennsylvania Volunteers. *Camp Winfield, North Carolina, quarter ending December* 31, 1861.

The 1st of October found the 48th Pennsylvania encamped at Camp Hamilton, near Fortress Monroe, and laboring under the usual epidemic of diarrhœa and dysentery to which new troops are liable. These diseases were at that time almost universal but manageable, no case terminating fatally. After their subsidence the health of the regiment was excellent, and continued so until the last week in October, when an epidemic of catarrh set in, having its origin in the exposure incident to the service during very inclement weather. This epidemic was also very general in its manifestations, and exceedingly painful in its symptoms, but readily yielding to treatment. During the first week in November typhoid fever made its appearance among us, following immediately in the footsteps of the epidemic catarrh, many of the cases of the latter appearing to glide by almost imperceptible gradations into a typhoid condition, with all the physical signs of the specific fever. On the 11th of November the regiment left Camp Hamilton, and on the 12th encamped at Fort Clark, near Hatteras Inlet. Immediately after our arrival numerous cases of typhoid fever, which had been in their incipiency on leaving Camp Hamilton, developed themselves fully, and being modified by the miasm of the island, assumed a malignant and unmanageable aspect, such as I had never witnessed

in any cases of the disease previously falling under my observation. In fact, in these cases typhoid fever, epidemic catarrh, remittent and intermittent fevers were so commingled and so complicated one another as to render the diagnosis very obscure, the treatment unsatisfactory, and the prognosis unfavorable. The most striking characteristic of this epidemic has been, in the graver cases, the almost total absence of tongue symptoms. In some cases which terminated fatally in a few days after the access of the disease there were no abnormal appearances of the tongue during the whole progress of the case; while those cases in which the tongue became heavily coated, dry, and red, made good recoveries. Between the 1st and 20th of December the regiment was moved from Fort Clark to Camp Winfield, about four miles north of Fort Clark. The general health of the command at present is good. Either from the prevalence of cool weather for the last two weeks, or because the troops are becoming acclimated, diseases having a malarious origin have almost disappeared. We have but few cases of severe aspect now under treatment. The men are here comfortably housed in barracks recently and well constructed for the purpose. The commissariat has generally furnished provisions abundantly and of good quality. The water here is not very palatable, and, being heavily loaded with vegetable matters, would doubtless, in warm weather, be a fruitful source of disease; but during the period of our occupancy of the island I have not been able to trace the origin of any case of disease to it.

### *Extract from the Report of* Surgeon Alois D. Gall, 13th Indiana Volunteers. *Suffolk, Virginia, quarter ending September* 30, 1862.

During the first part of the quarter and up to the middle of August the 13th Indiana was stationed at Harrison's Landing. During this period the sick report was rather large, but the diseases were of a mild character, consisting chiefly of diarrhœa, dysentery, and cholera morbus. But one death occurred during this period, which was a case of typhoid fever.

On the 16th of August the regiment took up the line of march for Yorktown, where it encamped a few days, and on the 24th of August marched to Hampton. It was poorly supplied with rations and water during this movement, and did some hard marching. We remained about a week at Hampton, which gave us an opportunity to recoperate somewhat. The diseases which prevailed during the march were of the same character as previously mentioned. No cases of interest occurred, and none were fatal.

August 31st, we were ordered to Suffolk, Virginia. Since being here the sanitary condition has been pretty good, when we take into consideration the unfavorable influences which have surrounded us. We are encamped on the flat pine land between the marshy banks of the Nansemond river and the borders of the great Dismal Swamp, a region favorable to the prevalence of malarious diseases. But although malarious fevers have prevailed to a considerable extent since we have been stationed here, yet they have not been of a very severe type. No case of a congestive or malignant form has occurred, but we have had many mild cases of typho-malarial, intermittent, and remittent fevers. The mildness of these diseases can probably be attributed to the unusually small amount of rain which has fallen during the autumn. Dysentery has also prevailed in a mild form to a considerable extent, which no doubt depends to a great degree upon malarious influences as a predisposing cause. The water is very bad, having a little brackish, unpleasant taste, and generally containing a copious sediment. A third unfavorable influence is the severity of the labor the men had to perform during the past three weeks, felling timber and throwing up earth-works during the day, and being placed on picket duty all night, sometimes for several days and nights consecutively. The regiment is fully supplied with rations, and has a good supply of other food from the surrounding country; it is also abundantly well furnished with clothing and moderately supplied with tents.

### *Extract from the Report of* Surgeon Charles C. Jewett, 16th Massachusetts Volunteers, *to* Medical Inspector Edward P. Vollum, U. S. A. *Army of the Potomac, October* 20, 1862.

The 16th Massachusetts was stationed at Camp Hamilton, near Fortress Monroe, from September 1, 1861, to May 8, 1862. Subsequently we shared in the movements of the Army of the Potomac on the Peninsula, and in Virginia in front of Washington. While at Camp Hamilton we had a slight epidemic of measles, and about the same time one of mumps. These affections were mild and required but little treatment. Diarrhœa was very prevalent while on the Peninsula. Most of the cases yielded readily to a treatment consisting in saline laxatives at first, either alone or combined with a mercurial, and followed by an astringent and opiate course.

### *Extract from the Report of* Surgeon James Wilson, 99th New York Volunteers, *to* Medical Inspector William H. Mussey. *Camp near Norfolk, Virginia, December*, 1862.

The diseases prevailing in the 99th New York at present are dysentery, intermittent fever, and diarrhœa. These are generally of the acute type and amenable to ordinary treatment. Far otherwise was a fatal type of dysentery which presented itself at Camp Greble, near Norfolk, in the latter part of September. In those cases the type was typhoid from the commencement. The discharges were abundant, of a reddish-brown or almost black color, and exceedingly offensive; the skin was cold and dusky, the tongue dark and dry, the teeth covered with sordes, and the pulse indicative of the greatest prostration. Fortunately only four of these cases occurred, three of them proving fatal; the fourth recovered under free stimulation.

### *Extract from the Report of the Inspection of the 3d New York Cavalry, by* Medical Inspector William H. Mussey, U. S. A. *Newbern, North Carolina, February* 27, 1863.

I found in the hospital of the 3d New York cavalry a case of colic which had existed three weeks without yielding to treatment. There was a broad blue line upon the edges of the gums, indicating lead poisoning. I found, on inquiry, that the patient had been treated for a long time previously with acetate of lead for dysentery. He had been taking fifteen grains of the acetate daily.

*Extract from the Report of* Assistant Surgeon GEORGE Z. BRETZ, 101st Pennsylvania Volunteers. *Camp near Long Bridge, Trent river, North Carolina, for the month of February*, 1863.

The 101st Pennsylvania has been encamped near Newbern, North Carolina, since December 21, 1862. We have suffered more or less all the time from diarrhœa and dysentery, apparently caused by miasmatic influences, imprudence in diet, lying on the ground, &c. The treatment has consisted in the use of catharties, such as calomel and rhubarb, followed by opium combined with tannin, acetate of lead, prepared chalk, persulphate of iron, or subnitrate of bismuth; the latter is a favorite article.

*Extract from the Report of* Assistant Surgeon DIXI CROSBY HOYT, 5th Massachusetts Volunteers, *to* Medical Inspector WILLIAM H. MUSSEY, U. S. A. *Newbern, North Carolina, March* 6, 1863.

Since the 5th Massachusetts left home in October, 1862, catarrhs and acute and chronic diarrhœa have prevailed to quite an extent. The cases of acute diarrhœa have been characterized by discharges of thin, light-colored, feculent matter, mixed with blood, but not accompanied by great pain or tenesmus. The treatment has consisted in the administration of sulphate of magnesia combined with a little laudanum. The chronic form has been very common. The symptoms have been frequent and copious evacuations, with pain and nausea just before each discharge, thirst, and loss of appetite. In the treatment rest, light diet, and a combination of opium with vegetable or mineral astringents have been relied upon. The men have always suffered less from diarrhœa, and indeed also from colds and other affections, whilst marching or bivouacking, than when in more permanent camps.

*Extract from the Report of* Surgeon DAVID MERRITT, 55th Pennsylvania Volunteers. *Edisto Island, South Carolina, quarter ending June* 30, 1862.

The prevalent diseases during the quarter were bilious remittent fever, which was apt to assume a typhoid character, and dysentery. The latter was mild, of a bilious character, and easily managed by the prompt and energetic employment of calomel, followed by full doses of some saline cathartic, such as Epsom salts.

*Extract from the Report of* Surgeon JOSEPH L. MULFORD, 48*th* New York Volunteers. *Fort Pulaski, Georgia, August* 31, 1862.

The cases of fever this month have been of a mild form. The symptoms are nausea and vomiting, great lassitude and weakness, pain in the back part of the head, with a heaviness on top as of the weight of a stone, pain in the knees, high-colored urine, dark stools, slight pain in the liver. In all cases I think the difficulty arises from an inactive liver. The treatment in most cases has been twenty grains of calomel followed by castor oil, this followed by five grains of quinia dissolved in water by aromatic sulphuric acid, three times daily.

The cases of dysentery this month have also been of a mild form, yielding to the ordinary treatment of blue mass, followed by castor oil with a few drops of laudanum, after which the strength of the patient is supported with port-wine and quinine.

The cases of diarrhœa have been the most troublesome and difficult to handle, and in most instances result from an almost entire absence of vegetables. The rations in other respects have been good and well cooked; but too much fresh meat without vegetables has caused a large proportion of these cases.

*Extract from the Report of* Assistant Surgeon JACOB H. SCHEETZ, 47th Pennsylvania Volunteers. *Beaufort, South Carolina, August* 31, 1862.

Remittent fever has prevailed to a considerable extent. It was characterized by a daily exacerbation and remission. The greater number of those afflicted with it presented the following symptoms: A general feeling of lassitude for two or three days, with partial loss of appetite, followed by chills and flashes of heat alternately; cephalalgia, felt principally over the orbits, of a sharp lancinating character, sometimes, however, described as a dull, aching, heavy sensation. The eyes were most generally suffused, skin sallow, tongue coated, thirst, anorexia. The bowels in the greater number of cases were torpid, but in others disposed to looseness; there was tenderness over the right hypochondriac and epigastric regions, frequent nausea, and sometimes vomiting. The pulse ranged from 85 to 115 per minute. The skin was hot and dry during the exacerbations, moist and flaccid during the remissions. The urine was generally high colored, and caused frequent complaints of a scalding sensation while voiding it, and there was a continual complaint of pain in the back and extremities, &c. The treatment which was found most beneficial was to administer a mercurial purgative in cases in which the bowels were torpid; when there was nausea, twenty grains of ipecacuanha were combined with it. After the intestinal canal had been acted upon, five grains of quinine were given from four to six times daily. When there was diarrhœa, half a grain of opium or five of Dover's powder were given with each alternate dose. When the peculiar effects of the quinia were apparent the disease readily yielded. The epigastric tenderness, when severe, was treated with sinapisms and opiates. The diet was as light as possible.

Diarrhœa prevailed considerably. The cases were uniformly mild, unaccompanied by any febrile symptoms, and yielded to treatment very readily. The treatment consisted of vegetable astringents and opium, tannic acid and catechu being the astringents principally used.

Dysentery also assumed a mild type, very few cases presenting much febrile action. The treatment consisted in administering two grains of tartar emetic with half an ounce of Epsom salts, and following it with a combination of acetate of lead and opium, or more frequently two drachms of castor oil and forty drops of laudanum three times daily.

### *Extract from the Report of* Surgeon William W. Brown, 7th New Hampshire Volunteers. *St. Augustine, Florida, quarter ending September* 30, 1862.

The 7th New Hampshire volunteers sailed from New York about the middle of February, 1862, and arrived at Fort Jefferson, Tortugas, Florida, on the 9th of March. About the middle of June we were ordered to Hilton Head, South Carolina, and encamped at Beaufort. When we arrived the weather was extremely hot and the atmosphere close and unpleasant. At Beaufort the sea breezes are cut off by the outside islands. Our encampment was under a beautiful shade of old live oaks. A general hospital had been established under the direction of Surgeon C. H. Crane, U. S. A., Medical Director of the Department of the South, and thither I was ordered to send all very sick men. Our men were rapidly attacked with bilious remittent fever. Our first cases were most severe, and typhoid symptoms came on early. Some twenty died during our first month at Beaufort. As the disease advanced it assumed a milder type. Nearly all the cases were attended with diarrhœa of a serous or bilious character, which was not easily controlled. Our treatment was at first an active mercurial cathartic, followed, when a remission occurred, with quinine in doses of ten grains. For the diarrhœa we gave a turpentine emulsion containing laudanum. We left Beaufort September 1st, and arrived at St. Augustine, Florida, on the 3d. Here the health of the regiment has evidently commenced to improve, though cases of fever similar to those we had at Beaufort still occur.

### *Extract from the Report of the same. St. Augustine, Florida, quarter ending December* 31, 1862.

Since our arrival at this place, on the third of September last, the health of the regiment has rapidly improved, and no sickness of any severity, having its origin here, has occurred. For several weeks after our arrival, however, as mentioned in my last report, cases of fever similar to those we had at Beaufort continued to appear; but although some of these were severe, all recovered except one. During the last two months nothing of the kind has occurred. When we left Beaufort we had as many as one hundred and fifty men unfit for duty, about one-third of whom were left in general hospital at that place. Of these several have died; some were discharged and sent home; a small proportion recovered and returned to duty; others were sent here to join the regiment who still had chronic dysentery, and who have since died. With regard to this fatal disease I wish to be permitted to make a few concise observations: Camp dysentery has a malarial origin, and, no doubt, is primarily of a congestive character. At the onset it is often connected with remittent fever of a bilious variety. This fever in some cases assumes a typhoid character and frequently proves fatal within ten days; milder cases subside within that period, leaving the patient much prostrated and with the dysenteric symptoms unabated. The alvine evacuations are usually frequent, varying from three to twenty or more in the twenty-four hours. The discharges are only symptomatic of the lesion of the mucous surface of the large intestine. The matter discharged is by no means uniform in character. Sometimes it is serous or aqueous and very profuse for a day or two; then for awhile it consists of mucus intermixed with blood, and has a dark, grumous appearance; watery discharges tinged with blood and mixed with more or less fæcal matter of a very offensive character follow. Thus the patient goes on for weeks, constantly emaciating as the disease continues. He is inclined to take food after his fever subsides, and not unfrequently renders his condition worse by indulging his appetite too freely. Very little nutriment is taken into the circulation, no doubt owing in part to a diseased condition of the mesenteric glands.

During the last month of the disease, for its average duration is about four months, the stomach suffers exceedingly, and nearly everything is vomited. During the last week of life the mouth becomes aphthous, and deep sloughs sometimes form, from which a dark-colored sanious, very fetid fluid drains. These ulcerations of the mouth and throat often bleed freely, and sometimes to an alarming amount, notwithstanding the administration of the most powerful astringents. At this stage the evacuations are usually involuntary and of a most offensive character, filling the atmosphere in the neighborhood of the patient with a strongly marked gangrenous odor, and finally death is a welcome friend both to the patient and attendant.

In *post mortem* examinations I have not usually inspected the brain, and have generally found the heart and lungs healthy. The gall-bladder is full of thick viscid bile. The stomach always shows signs of inflammation; its blood-vessels are distended with blood, giving the mucous membrane a red color, especially near the pyloric extremity. In the small intestines also the mucous surface shows signs of inflammation, which probably does not take place before the last stage of the disease approaches. The chief seat of the disease is the large intestine; the peritoneal surface is unchanged in structure, but the mucous surface is only a mass of disease. We find the cæcum and every part of the colon and rectum much increased in weight and solidity, thickened, and in some parts the caliber so diminished as scarcely to admit the index finger, and within, throughout the whole length, numerous ulcerations, which are deepest where the weight of the intestine is greatest.

In the treatment it is found important at first to unload the portal system by a brisk mercurial cathartic or an emetic of ipecacuanha and tartarized antimony; then to give spirits of turpentine with mucilage and laudanum. A cautiously regulated diet is required, and quinine and occasionally stimulants are indicated by the symptoms. Absolute rest is of the greatest importance. I have also derived much benefit from dry cupping the epigastrium and abdomen, followed by bathing with turpentine lotions. Blistering the abdomen in many cases has had a most desirable effect. After the disease has continued some time recoveries are rare, yet by great attention to diet and regimen even extreme cases get well. I have made a thorough trial of the acetate of lead combined with opium, and of tannic acid with anodynes, but without good results. Nitrate of silver has acted well in some cases, but cannot be relied upon as a rule. I have also tried strychnine and Fowler's solution, but only to be disappointed. In the advanced stages great benefit has been derived from the free use of tincture of chloride of iron and brandy, with opiates and a simple nourishing diet.

### *Extract from the Report of* Surgeon David Merritt, 55th Pennsylvania Volunteers. *Beaufort, South Carolina, quarter ending December* 31, 1862.

We had many cases of intermittent fever which were generally mild in character. One of their most prominent complications was a periodical congestion of the bowels, simulating acute dysentery both in the frequency of the discharges and in the

fact that they often consisted of mingled mucus and blood. This appears to be the species of dysentery described by Eberle in his Practice of Medicine as prevailing at times in the valley of the Mississippi. In the treatment of such cases I found quinine advantageous. Sometimes I used no other medication, and when the paroxysms were cut short, I generally found the bowels became regular and the passages normal in character. In other cases the careful use of astringents, besides the quinine, seemed demanded.

### *Extract from the Report of the same to* Medical Inspector William H. Mussey, U. S. A. *Beaufort, South Carolina, May* 10, 1863.

The 55th Pennsylvania reached Hilton Head December 11, 1861, and has been in the department of the South ever since. Acute diarrhœa has been very prevalent in the regiment; I believe the bad quality of the drinking water was generally the principal cause. Whenever this was the case a combination of tannic acid, camphor, and opium was the most successful mode of treatment. When the diarrhœa was of a miasmatic origin, quinine was of course associated with whatever medicines were employed. We have also had considerable chronic diarrhœa, which resisted almost every plan of treatment, so that it was generally thought best to send the patients to general hospital. In the cases treated in camp, astringents proved of little advantage. It is better to promote the secretion of the liver, to act upon the skin and kidneys, and to give unirritating nourishing food. Quinine and Fowler's solution have also been given with advantage, and nitrate of silver or creasote when ulceration of the bowels has been suspected. But in fact the disease in this climate often seems to baffle all treatment, and the best plan is to send chronic cases to the north.

### *Extract from the Report of* Surgeon B. F. Harrison, Independent Battalion New York Volunteers, *to* Medical Inspector William H. Mussey, U. S. A. *Beaufort, South Carolina, May* 21, 1863.

The prevailing diseases have been intermittent fever, diarrhœa, and dysentery. The last two diseases, so long as they were functional, were for the most part managed with ease. The diarrhœa yielded to rhubarb or magnesia, with some simple bitters and aromatics, such as calumbo and ginger or cinnamon. The dysentery, when there was no ulceration, was successfully treated with an ounce of sulphate of magnesia and quarter of a grain of morphine. When this was followed up with the treatment for diarrhœa, it was usually sufficient; but when ulceration occurred the cases were more difficult to manage, and during the autumn we had a number that baffled all our efforts. In two or three of these in which *post mortem* examinations were made the ulcerative destruction of the rectum and colon was remarkable. In one case not more than one-twentieth of the mucous membrane remained intact in the rectum and lower part of the colon. There was, moreover, much thickening of the walls of the intestines, so that they felt like India-rubber tubes of the same size and about a quarter of an inch in thickness. Some of the ulcers were so deep that they appeared nearly to perforate the intestines, and in one case we could not determine if the perforation was complete or whether the tissues had merely broken in the dissection. In no case of dysentery which we examined did ulceration exist in the small intestine.

It may be inquired how cases of functional dysentery can be distingnished from the structural or ulcerative cases. When the ordinary remedies only produced partial relief it was safe to infer that the tissues were already involved. Often in the later stages purulent matter of the character yielded by scrofulous ulcers was seen in the stools, as also débris of the mucous membrane mingled with blood; but such matters did not usually make their appearance until the general symptoms left little room to doubt. There was sometimes tenderness of the abdomen on pressure, and sometimes none at all, from the beginning to the end of the case; but in every case the abdomen was shrunken, the intestines seeming to be packed away in the pelvis and by the side of the spine, so that the anterior wall of the abdomen receded to the spine.

In the treatment of dysentery we used injections of nitrate of silver in solution a few times, but it answered my expectations so little that I soon discontinued its use. I only used six or eight grains to the ounce. From what I have learned from others, however, I would employ it again under similar circumstances, using fifteen or twenty grains to the ounce. We thought the cases in which ulceration had taken place did best with low diet, mild astringents, and bitter tonics.

### *Extract from the Report of* Surgeon Samuel F. Forbes, 67th Ohio Volunteers, *to* Medical Inspector William H. Mussey, U. S. A. *Folly Island, South Carolina, May*, 1863.

The 67th Ohio was recruited chiefly at Camp Oliver, Toledo, Ohio. It moved to Camp Chase, Columbus, Ohio, December 24, 1861, and set out for western Virginia January 19, 1862. It subsequently became a part of the division of General Shields; was sent to join General McClellan at Harrison's Landing, arriving there July 2d; thence went to Suffolk, Virginia, where it remained from September 1st to the end of the year. It was then sent to North Carolina, and afterward to South Carolina, arriving at Port Royal February 8th, and moved to its present camp at Folly Island April 13th. Our camp here is a narrow bed of sand, with the ocean on one side and a creek and marshes on the other. The weather is generally very warm in the fore part of the day, but the latter part is quite delightful from the fine ocean breezes. The drinking water is very bad, and is doubtless the cause of much of the diarrhœa which prevails. Typhoid fever and dysentery have also prevailed in the regiment, arising, I think, from the confinement of our late sea voyage, and the fact that the ports of the Collins took in water and the men were obliged to lie on the wet floors, as there were no bunks for them. The dysentery has probably been aggravated by the warm days and cold nights, the bad water, and the want of vegetable food.

In the treatment of these cases, both here and previously, we have been quite successful, not having lost a case out of seven hundred and seventy-five occurring since we went into the field. The plan has been to administer gentle laxatives of castor oil or of a saline mixture, alternated with opiates every other day. We had an epidemic of measles in January, 1862, which broke out at Camp Necessity, on the Baltimore and Ohio railroad, and continued, while the regiment was at New Creek

and Paw-Paw tunnel, during the month of February and the early part of March. In all there were ninety-three cases, of which nine died with the regiment, and over seventy were sent to general hospital at Cumberland, of whom I am informed a number died. We had also an epidemic of mumps while at Paw-Paw tunnel.

### *Extract from the Report of* Surgeon CHARLES H. HOOD, 62d Ohio Volunteers. *Camp near Strasburg, Virginia, quarter ending March* 31, 1862.

The 62d Ohio suffered from measles during January. It arrived at camp Kelley, Maryland, January 20, 1862. Diarrhœa and pulmonary catarrh soon became prevalent, from seventy-five to ninety men presenting themselves daily at sick-call. The diarrhœa cases were often troublesome, and in many instances presented well-marked dysenteric symptoms, and while the patients continued to use the water in and around the camp we found our remedial measures almost entirely unavailing, while a strict abstinence from all liquids, and especially from the water around us, with suitable aperients and tonics, were very effectual in completely curing the disease.

### *Extract from the Report of* Surgeon JOSEPH B. POTTER, 30th Ohio Volunteers. *Fayetteville, western Virginia, quarter ending March* 31, 1862.

The prevalent diseases during this quarter have been fevers, diarrhœa, jaundice, and catarrhs. These diseases have prevailed among the citizens in about equal proportions and severity as with the troops. The fever classed as typhoid is not the disease so recognized by most physicians in private practice, but a continued fever of typhoid type, modified by change of habits, food, and to a certain extent climate. Many cases when first reported are found delirious, with cold extremities, congestion of the capillaries of the surface, profuse perspiration, pulse 120 to 160 per minute and feeble, profuse watery diarrhœa, followed by a fatal termination in from forty-eight to seventy-two hours. All these cases require stimulants, as quinia, carbonate of ammonia, brandy, &c., from the commencement of treatment. Intermittent fevers have been mild in character, and readily amenable to treatment.

Diarrhœa during January was almost universal; scarcely a person was exempt. Cases gradually became of milder character during February and March. The treatment found to be of most service was opiates in combination with astringents and stimulants, and occasional saline cathartics; mercurials were almost universally injurious. Jaundice was prevalent in January and February, but has now entirely disappeared.

### *Extract from the Report of* Surgeon HENRY K. STEELE, 44th Ohio Volunteers. *Camp Meadow Bluff, western Virginia, June* 30, 1862.

We have suffered very much during the past month from diarrhœa and dysentery, and an epidemic of measles is commencing. The first two diseases I attribute to the drinking water, which is so much charged with vegetable matter as to be unpleasant to the taste. It is surface water, and we are dependent upon the frequent rains for our supply. We are encamped in the woods, surrounded on all sides by marshes, and have no tents.

### *Extract from the Report of* Surgeon JAMES K. BIGELOW, 8th Indiana Volunteers, *to* Medical Inspector GEORGE W. STIPP. *Department of the Gulf, February* 20, 1864.

The 8th Indiana was mustered in at Indianapolis, Indiana, September 5, 1861. It had previously served as a three-months' regiment in western Virginia. Subsequently, until March, 1863, it campaigned in Missouri and Arkansas. Afterward it took part in the operations against Vicksburg, was transferred to Carrolton, Louisiana, in August, 1863, and is now at Indianola, Texas. During the time it was in western Virginia the prevailing disease was a mild form of dysentery, which generally resulted favorably. During the autumn of 1861 we had an epidemic of measles; with this exception diarrhœa and dysentery have been at all times the most prevalent diseases.

Dysentery made its appearance first at Georgetown, Missouri, about the last of September, 1861, and assumed huge proportions at the outset. In our regiment, which then numbered about seven hundred and fifty or eight hundred men, we had a morning sick report averaging about one hundred and seventy-five cases daily. The symptoms were not different from ordinary dysentery, except that the disease was ushered in much more speedily than usual. A soldier, seemingly well in the morning, would frequently have well-developed dysentery the same day. I may state, too, that the usual nervous prostration attendant on that disease was not so well marked during this epidemic; it seemed, indeed, in the majority of cases to disturb the constitution but slightly. The soldiers were nearly all treated in their quarters, because so many cases could not be provided with hospital accommodations, and they were usually able to attend sick-call notwithstanding the pain, tenesmus, muco-sanguineous discharges, and other symptoms of acute dysentery. In the treatment vegetable astringents and dietetic measures were tried at first, but without avail; then we resorted to the mineral astringents, such as nitrate of silver, sulphate of iron, acetate of lead, &c., without other effect than to cause occasional mischief with the lead, probably owing to the chemical condition of the water of that region. Sulphate of magnesia or rhubarb, followed by opium and quinine, with dietetic and hygienic measures, were finally relied upon, and usually with prompt success.

### *Extract from the Report of* Surgeon GEORGE L. LUCAS, 47th Illinois Volunteers. *Jefferson City, Missouri, quarter ending December* 31, 1861.

The 47th Illinois was organized at Peoria, Illinois, last August. Less than half the men came from the high prairie region, the others from the flat prairies where miasmatic influences prevail. While at Peoria the prevailing diseases were diarrhœa and intermittent fever. We arrived at Camp Benton, near St. Louis, Missouri, September 22d, and at Jefferson City October 10th. We still continue to suffer from intermittents and diarrhœa, but to these typhoid fever has been superadded.

*Extract from the Report of* Surgeon J. R. Veeter, 2d Missouri Volunteers. *Camp near Rolla, Missouri, quarter ending December* 31, 1861.

The most prevalent diseases in the 2d Missouri during the past quarter were quotidian and tertian intermittents, diarrhœas, and dysenteries. These are due, as I think, partly to the atmospheric influences of the autumnal season during our movements through parts of the country where these diseases are prevalent every year, and partly to the exhaustion of our soldiers, who have been compelled to move by forced marches, sleeping on the bare ground protected at night by only a single blanket, and often having wet shoes from crossing creeks and rivers. The diet also was bad; at times for days together the soldiers had nothing but fresh meat, either beef or pork, without salt, and no bread or vegetables could be obtained.

*Extract from the Report of* Assistant Surgeon J. C. G. Happersett, U. S. A., 1st United States Infantry. *Camp near New Madrid, Missouri, quarter ending March* 31, 1862.

Before the evacuation of New Madrid by the enemy, and while wells were being dug, the men used the water from the pools in the neighborhood of their camp for drinking purposes. This was followed by the most intractable diarrhœas. The companies suffering most were those who joined us at St. Louis, and who were just from Key West, Florida.

*Extract from the Report of* Surgeon Clarke G. Pease, 2d Wisconsin Cavalry. *Cassville, Missouri, quarter ending June* 30, 1862.

Early in April, while the 2d Wisconsin cavalry was at Benton Barracks, the influence of the water of the Mississippi began to manifest itself by the development of frequent cases of diarrhœa. After we reached Jefferson City, the water of the Missouri proved still worse, and within a few days after our arrival at that place a number of cases of great severity occurred. The water of the country lying between the Missouri and the Osage is highly impregnated with magnesia. The weather, during our march across the country, was warm, and the men drank largely; as the result of this, many cases of diarrhœa occurred, some of which have been very intractable.

*Extract from the Report of the same. Springfield, Missouri, quarter ending September* 30, 1862.

During the extreme heat of July diarrhœa was very prevalent, and often severe; very little dysentery, however, occurred. Jaundice in all its varieties, and in some cases of great severity, has been common, and under circumstances which have led me to believe that food rather than climate has been the exciting cause. Sudden changes from soft bread and fresh meat to an exclusive diet of hard bread and salted meats, or the reverse of this, have invariably been followed by an increase of the number of cases of diarrhœa and jaundice. Indeed, I am of the opinion that hard bread, used as it is by most of the soldiers in this army, is a potent cause of diarrhœa and of numerous cases of dyspepsia, which prove wellnigh incurable. This battalion has been much employed in scouting, and consequently has been much exposed to the weather and to great fatigue; but I have observed that fewer men are taken sick, in a given time, while on a scout than while lying in camp. Idleness and the atmosphere of the camp are the most prolific sources of disease.

*Extract from the Report of* Surgeon Henry P. Strong, 11th Wisconsin Volunteers. *Camp near Des Arc, Arkansas, quarter ending June* 30, 1862.

During the greater part of the quarter the 11th Wisconsin has been on the march through the States of Missouri and Arkansas, most of the time in swampy and miasmatic regions. The days have been hot, the nights cold. I was a little surprised, during the latter part of May, to notice scorbutic symptoms in several cases, for a fair proportion of fresh meat and desiccated vegetables had been issued to the men. There have been no cases of fully developed scurvy, and I have not observed sponginess of the gums in a single case; but in several I have observed spots of purpura on the legs or body, and in some of the cases of dysentery and of remittent fevers, hæmorrhages from the nose or fauces. Most of the cases of dysentery have been bilious or remittent in character, and exhibit a strong tendency to become chronic. In the treatment I have found astringents worse than useless in most cases. The plan of first evacuating the bowels thoroughly and then arresting the peristaltic action by an opiate has proved the most successful; but, in the cases which came under my observation, mercurials have proved more efficient than saline cathartics.

*Extract from the Report of* Surgeon Benoni O. Reynolds, 3d Wisconsin Cavalry. *Cassville, Missouri, July,* 1862.

Mild intermittents and remittents have prevailed to some extent during the month, and there have been many slight cases of diarrhœa, which were, for the most part, successfully treated in quarters with opium and camphor. Dysentery also prevailed to some extent, but has been of a very mild character. When a patient presented himself with symptoms of this disease, I usually directed an ounce of sulphate of magnesia, and, after the free evacuation of the bowels, gave opium in grain doses every three or four hours until two or more doses had been taken. Generally no other medicines were required.

*Extract from the Report of the same. Leavenworth, Kansas, quarter ending September* 30, 1862.

Many cases of diarrhœa and dysentery have been treated during the quarter. With regard to the treatment of the latter disease I take pleasure in adding my testimony to the efficiency of what is termed the saline treatment. Our cases have almost invariably yielded to a large dose of sulphate of magnesia, followed, after free catharsis, by one or two-grain doses of opium.

*Extract from the Report of* Assistant Surgeon George C. Jones, 3d Missouri Cavalry. *Rolla, Missouri, July and August,* 1862.

Diarrhœa and dysentery prevailed to a considerable extent in the 3d Missouri cavalry from shortly after its arrival in Rolla, June 20th, until the close of July, with comparatively few cases of malarial fever. The cases of diarrhœa showed a disposition to run into a more inflammatory grade of disease in the large intestine if neglected for a few days.

The diarrhœa, when severe, was attended with much griping in the bowels, and considerable headache and pain in the back. The arrest of the discharge, when attempted by opium or other means, almost invariably had the effect to increase the pain in the bowels, head, and back, and it became necessary nearly always, when such a result was obtained, to administer a purgative. Nevertheless, opium, in some of its forms, was much relied on in the treatment, especially when the diet of the patient could be controlled so that no ingesta should be received into the stomach which would be likely to irritate the already irritated mucous membrane; it was usually sufficient for the cure, but occasionally required to be combined with some vegetable or mineral astringent. Considering the slight control we can have over the habits of men in camp in regard to eating, few cases of diarrhœa merged into dysentery, and the number of primary cases of dysentery was not large. Those which occurred were characterized by frequent and bloody discharges from the bowels, with a great deal of tormina, tenesmus, and abdominal soreness. The circulation was invariably more or less disturbed, the grade of the fever being generally in proportion to the degree of inflammatory irritation present.

The treatment consisted in a purgative of castor oil or of calomel, followed by sulphate of magnesia when portal congestion was suspected; this was followed by anodynes in the form of opium or Dover's powder, to relieve pain and restrain peristaltic action. In addition to this internal treatment, local measures were addressed to the abdominal parietes, such as sinapisms, turpentine stupes, and dry or wet cups. The latter were never omitted when the case assumed an aspect at all threatening, and were uniformly beneficial. Injections of cold water and laudanum, to restrain tenesmus, were likewise found to afford great relief. The constitutional action of mercury was not required in a single case.

During the month of August there was a notable increase in the number of cases of fever of a remittent and intermittent type, with a sensible diminution of the cases of diarrhœa and dysentery.

*Extract from the Report of* Surgeon John W. Scott, 10th Kansas Volunteers. *Department of Missouri, quarter ending September* 30, 1862.

During the month of July the 10th Kansas was in the Cherokee country, and scorbutic symptoms appeared among the men, owing to the lack of fresh vegetables. A supply of desiccated vegetables having been obtained, these symptoms disappeared. Throughout the quarter there was a large number of cases of simple diarrhœa, caused by irregularities in diet and sudden changes in the temperature and hygrometrical condition of the atmosphere. We had also many cases of malarious fever, the remittent type prevailing; a few of the cases assumed a typhoid form.

*Extract from the Report of* Surgeon William H. White, 22d Iowa Volunteers. *Post hospital, Rolla, Missouri, for the month of November,* 1862.

The cases of dysentery received into this hospital during the month were, many of them, severe. They presented no remarkable symptoms except that the discharges contained rather more blood than is commonly seen, and that there was an unusual tendency to sinking. In the treatment, calomel combined with some of the alkalies, diaphoretics, opium, and astringents have been employed, with frequent injections of nitrate of silver or iodine, as in the following formulæ: ℞. Nitrate of silver eight grains, water two ounces; or, ℞. Iodine and iodide of potassium, of each ten grains, sulphate of morphia half a grain, water three ounces. After the injection of either of these solutions there would seldom be another stool in less than two or three hours, even when they had previously been occurring every few minutes. At the same time a large blister was applied over the abdomen, and good beef-tea or rich chicken-broth allowed. The success of this plan of treatment has been entirely satisfactory.

Anasarca has followed many of these cases of dysentery, as well as those of chronic diarrhœa and typhoid fever. It has generally subsided under the influence of iron and tonics. In some cases friction with a stimulating liniment has appeared to be a useful addition to the treatment.

*Extract from the Report of* Surgeon Andrew W. McClure, 4th Iowa Cavalry. *Camp near Helena, Arkansas, quarter ending December* 31, 1862.

Diarrhœa and dysentery, aggravated by the malarious atmosphere of this region and by improper diet, have contributed their share towards thinning our ranks. The saline treatment, with opium, has succeeded better in my hands than any other remedies in this class of cases.

### *Extract from the Report of* Assistant Surgeon William W. Granger, 3d Missouri Cavalry. *Houston, Missouri, December* 31, 1862.

Diarrhœa and dysentery have been very troublesome, and many of the cases have become chronic. The obstinacy with which, at times, these complaints resist all treatment, and even after an apparent cure return on the slightest exposure or unavoidable irregularity in diet, is truly trying. Alteratives, tonics, especially the mineral acids, and preparations of iron and vegetable astringents, have afforded me the best results in the majority of cases. I have also found quinine of great benefit in some instances which could be traced back to a malarious origin. Rest, regularity, temperance, and proper selection of diet are also indispensable. As winter advances the number of cases is diminished, and perhaps the dear-bought experience of the past year may be of service to us next summer. In acute dysentery I have been most successful so far in using opiates to allay the tormina, while free evacuations of the colon have been induced by bland injections of tepid water or starch-water. After filling and emptying the colon once or twice, I give a two-ounce injection of water containing ten grains of nitrate of silver with a drachm of laudanum. This is repeated once, twice, or oftener during the day. Next to this plan, and many good surgeons prefer it, I rank the repeated administration of saline purgatives till free watery discharges are procured; meanwhile, and for twenty-four hours after, nearly all fluids should be withheld from the patient.

Acute diarrhœa has generally demanded a different and longer course of treatment. The mucous and serous forms have very generally yielded readily to a brisk mercurial purgative followed by opiates and astringents. If, within twenty-four hours after purgation, the discharges were not so modified in frequency and character as to indicate convalescence, I have sometimes repeated the mercurial purge, or prescribed quarter-grain doses of calomel, combined with the opiates and astringents. These small doses I seldom continue more than a day or so, after which the opiates and astringents are continued. In the sanguineous form of diarrhœa I have found saline purgatives, pushed till free watery discharges ensue, and followed by anodynes and astringents, with blue mass in two-grain doses on alternate days, the most satisfactory mode of treatment.

### *Extract from the Report of* Surgeon Allen F. Peck, 1st New Mexico Volunteers. *Fort Stanton, New Mexico, quarter ending December* 31, 1862.

Many of the cases of diarrhœa and dysentery were caused by intemperance in some form, although the weather has been such as to favor the production of this class of diseases, the days having been quite warm and the nights cold.

In the treatment of diarrhœa I find half an ounce of castor oil with half a drachm of oil of turpentine, administered at once, produces very happy results; and half an ounce of sulphate of magnesia, with mucilaginous drinks and a bland diet, answered very well in the cases of dysentery. In cases of either disease which were not checked by these simple remedies, I used small doses of some mercurial, or acetate of lead, combined with enough Dover's powder or opium to quiet pain.

### *Extract from the Report of* Surgeon William H. Grimes, 13th Kansas Volunteers. *Camp near Springfield, Missouri, January* 31, 1863.

A number of cases of dysentery and diarrhœa occurred during January. Both these diseases have prevailed, to a greater or less extent, ever since the 13th Kansas has been in the field. Neither officers nor men are exempt. I attribute both disorders to imprudences in diet, which always characterize new recruits, and to drinking surface water. Many of the cases have been obstinate; there were, however, but few deaths. The treatment which seemed most successful was a purge of Epsom salts, followed by astringents such as tannin, acetate of lead, &c., combined with opium. The use of cold water by the sick was prevented, as far as practicable, as we always found it aggravated the symptoms.

### *Extract from the Report of* Surgeon Benjamin F. Stevenson, 22d Kentucky Volunteers. *On board the steamboat Crescent City, near Vicksburg, Mississippi, January* 9, 1863.

We left Portland, Ohio, October 20th, crossed the Ohio river at Gallipolis on the 22d, and reached Charlestown, West Virginia, on the 28th. While at Charlestown a marked increase in the number of diarrhœa cases was observed. This was in part due, no doubt, to errors of diet; but, in my judgment, a much more fruitful source both of diarrhœa and dysentery is to be found in disturbances of the functions of the skin. The soldier is often compelled to lie on the wet ground in damp clothes and in a wet blanket; the surface is chilled, and the fluids, repelled from the integument, are precipitated upon the mucous membranes. The intestinal canal, already disordered by injudicious alimentation, is particularly liable to suffer under these circumstances.

### *Extract from the Report of* Surgeon John L. Taylor, 3d Missouri Cavalry. *Little Rock, Arkansas, June* 30, 1864.

Dysenteric diarrhœa occurred to a considerable extent in the 3d Missouri cavalry during the month of June. The mean strength of the command was one thousand, and there were fifty cases during the month. In these cases, at the outset, the stools were composed chiefly of unnaturally fluid fæcal matter mingled with blood and mucus. The majority of cases ran their course with very little disturbance of the circulation, and yielded readily to saline cathartics. The tenesmus was greatly alleviated by mucilaginous and anodyne enemata. In the administration of Epsom salts we have in view the production of one or more watery alvine discharges, that the portal vessels may be unloaded and all crude ingesta removed from the alimentary canal.

The patient found in almost every instance a soothing and comfortable effect when watery discharges were produced. After this, enemata of warm starch-water with laudanum allayed the distress, and a rapid convalescence followed, without repeating the salts.

Four-fifths of the cases were attributable to exposure to wet and cold; the remaining fifth to malaria and the use of unwholesome food, such as fresh pork, green apples, &c. Five cases were attended with more or less fever, which was attributable, no doubt, to malarious poison. These cases I have denominated on the prescription book "malarial dysenteric diarrhœa." The fever in these cases began before the local symptoms declared themselves. The fever ran high, the pulse was hard and frequent, the skin hot, the face flushed, the tongue furred, and the patient complained of headache and thirst. The pulse very soon became small and weak, while the strength rapidly declined and the temperature of the body sank. With these patients there existed also an enlarged spleen.

I have found that nitric acid combined with ipecacuanha successfully met this condition. I have always been satisfied that these remedial agents, separately, exercised a decided influence on the liver; the combination proves a more valuable hepatic remedy than when the medicines are given alone. I gave four drops of nitric acid with four grains of ipecacuanha in a fluid ounce of water every four to six hours. In the treatment of ordinary cases, in addition to saline cathartics, wet cupping upon that portion of the abdomen where pressure caused the most pain, mucilaginous anodyne injections, and turpentine stupes are advantageous. So soon as the bowels are thoroughly emptied, five grains of quinine with ten of Dover's powder may be given three or four times daily, and continued so long as fever exists. In the malarious cases quinine proves very efficient, the more obstinate cases giving way in from four to six days. The patients were then treated with tincture of the chloride of iron, which seemed to obviate the tendency to repeated attacks. In some patients tenesmus remains after the more prominent symptoms of the disease have been removed. Usually this condition is dependent upon ulceration low down in the rectum. Injections of two fluid drachms of tincture of the chloride of iron in an ounce of water three times daily, or *pro re nata*, have afforded prompt relief in nearly every case. * * *

While my experience sustains the success of saline purgatives in the commencement of dysentery and diarrhœa, it equally sustains the fact that a too frequent repetition of this purgative, as advocated by some for the purpose of procuring natural stools, in nearly every case increases the irritation of the bowels and augments considerably the suffering of the patient. It is unquestionably true that when ulceration of the intestines exists purgatives are inadmissible. In this condition I have found from four to six drops of Fowler's solution daily an efficient remedy. It answers a better purpose than the alternate use of laxatives, opiates, and astringents. * * *

## *Extract from the Report of* Acting Assistant Surgeon J. D. Skeer. *Camp of the 16th United States Infantry, near Chicago, Illinois, September*, 1861.

The camp of the 16th infantry, on the Oplain river, sixteen miles northwest of Chicago, is bounded on the east and north by a marsh. This circumstance accounts for the large number of cases of ague and diarrhœa among our men during the month, most of the latter being of a decidedly bilious character, having well-marked remissions and exacerbations, and requiring the use of antiperiodic medicines. Sulphate of quinia has been chiefly used for this purpose.

## *Extract from the Report of* Assistant Surgeon Havilah M. Sprague, U. S. A. *Alton, Illinois, March* 31, 1862.

The battalion of the 13th U. S. infantry at this post is on duty as guard to the prisoners of war. I joined the command December 25th, and found the men suffering from an epidemic of measles. The cases were mild, and none of them were followed by pneumonia; but bronchitis, with marked debility, was left behind in many cases, and in a few (chiefly feeble young men of phthisical families) tuberculosis was developed. Mumps subsequently made its appearance and went through the battalion. It has been very mild, requiring no treatment except in a few cases in which metastasis to the testicles took place. About the first of March a great number of cases of diarrhœa appeared. They were usually quite simple. The discharges were usually yellowish and watery, sometimes ashy, black, or greenish. They were attended with colicky pains and slight tenderness of the bowels; usually there was no febrile reaction. In a very few cases it terminated in mild dysentery. In quite a proportion it has shown a tendency to become chronic, and considerable difficulty has been experienced in checking it permanently.

## *Extract from the Report of* Surgeon Thomas G. Cleveland, 41st Ohio Volunteers. *Camp Wood, Ohio, September* 30, 1861.

The chief diseases during the month of September were diarrhœa and dysentery. Most of the cases occurred at two distinct periods, each lasting four or five days and then subsiding, from which it would appear the cause was atmospheric. The weather at these times was warm and clear during the day, but the nights were cold, the variation in temperature from day to night being very considerable. The men, having only one blanket apiece, were indifferently protected from these changes, and as there was a short allowance of tents they were so crowded that many slept in the open air. Many cases of subacute rheumatism appear to have been due to the same cause. Moreover, the influence of malarial poisoning is seen in many cases assuming a great variety of irregular forms, though with comparatively few cases of clearly defined intermittent fever.

## *Extract from the Report of* Surgeon Roswell G. Bogue, 19th Illinois Volunteers. *Camp Jefferson, Kentucky, quarter ending December* 31, 1861.

During the last summer and early fall the 19th Illinois operated in highly malarious districts, which caused a great deal of intermittent fever and diarrhœa, the effects of which have continued to influence the diseases of the men until the present time.

### *Extract from the Report of* Surgeon CLAIBORNE J. WALTON, 21st Kentucky Volunteers. *Camp Fry, Adair County, Kentucky, quarter ending March* 31, 1862.

The 21st Kentucky was composed in part of recruits from Lexington, Kentucky, and the surrounding country, and of about an equal number from the Green river region. The latter, with few exceptions, had never had measles, and that disease broke out in November, 1861, and a large number of cases occurred. The mortality was small, but the patients were left in a debilitated condition, and coughs and colds were common for a long time after. However, the only diseases which gave us much trouble were diarrhœa and typhoid fever.

We had during the quarter two hundred and twelve cases of diarrhœa, most of which were very stubborn. To this number we might add a great many cases which were not recorded and only required a dose or two of opium to relieve them. The principal causes of diarrhœa were doubtless the manner in which the soldiers did their cooking, and sleeping in damp tents with but little straw, eight or ten crowded into a small bell-tent. All the cases were accompanied by considerable constitutional depression. The treatment was opium, tannin, acetate of lead, and turpentine. In stubborn cases I gave a grain of opium and quarter of a grain of sulphate of copper three times daily. When they seemed likely to become chronic I gave a grain of opium and quarter of a grain of nitrate of silver three times daily. To patients who were very weak and debilitated I sometimes gave, with very decided benefit, a grain each of opium and persulphate of iron, with three of camphor. A few very difficult cases were benefitted by the use of aromatic sulphuric acid in ten-drop doses three times daily. Quite a number of the cases occurred in those who had had measles. I saw some cases that presented a most unfavorable appearance cured by a liberal dose or two of opium.

### *Extract from the Report of* Surgeon EDWARD L. HILL, 20th Ohio Volunteers. *Crump's Landing, Tennessee, quarter ending March* 31, 1862.

The 20th Ohio left Cincinnati on transports February 11, 1862, for Fort Donelson, and participated in the siege. Subsequently it was sent as an escort of prisoners of war to St. Louis, Missouri; after which two companies were sent with prisoners to Camp Douglas, Illinois, two to Indianapolis, Indiana, and three to Columbus, Ohio; one of the latter companies afterward went to Boston, Massachusetts. March 5th, the able-bodied men of six companies rendezvoused at St. Louis and started for the Tennessee river.

After the siege of Fort Donelson diarrhœa was the prevailing disease. It attacked all the detachments alike, whether at St. Louis, Indianapolis, Columbus, or Boston. It was of a typhoid type, attended with debility and great prostration, requiring tonics and stimulants in addition to the ordinary treatment, and often difficult to cure. If in this debilitated condition one took cold, and all seemed peculiarly susceptible to atmospheric changes and the ordinary causes producing colds, he was almost sure to have pneumonia, which early assumed a typhoid type and proved very fatal.

While on the steamboat going up the Tennessee river diarrhœa became still more general, and after landing, though we had a pleasant camp and an abundant supply of tolerably good water, there was no improvement. Dejection, depression of spirits, listlessness, and melancholy prevailed among the men.

### *Extract from the Report of* Surgeon SHUBAL YORK, 54th Illinois Volunteers. *Jackson, Tennessee, quarter ending March* 31, 1862.

The fevers which prevailed during the quarter among the men of the 54th Illinois have been chiefly intermittents and remittents, which readily yielded to treatment, but very often relapsed. It should be mentioned that all last summer and autumn the regiment was exposed to the influence of malaria in the low lands of Tennessee, and most of them had attacks of intermittent or remittent fever at that time. Diarrhœa and dysentery prevailed to a moderate extent during the quarter; they were of an asthenic form, but yielded readily to mild alterative and anodyne measures.

### *Extract from the Report of* Assistant Surgeon DALLAS BACHE, U. S. A. *Camp near Stevenson, Alabama, quarter ending June* 30, 1862.

Battery H, 5th artillery, U. S. A., was occupied during the months of April and May in slow approaches from Pittsburg Landing to Corinth, Mississippi, and, since the capture of Corinth, a constant drought and the character of the surface water obliged the troops to resort to such wells as they could dig for the necessary supply. This was a prolific source of diarrhœa, complicated with malaria, and made doubly obstinate by the scorbutic taint induced by want of vegetables and the monotonous character of the food.

### *Extract from the Report of* Surgeon JOHN C. HUBBARD, 41st Ohio Volunteers. *Athens, Alabama, quarter ending June* 30, 1862.

After the siege of Corinth the 41st Ohio marched through northern Mississippi and northern Alabama to its present camp. Serous and mucous diarrhœa have been the prevailing diseases. These fluxes are very often obstinate and protracted; relapses are common, and in young soldiers bring on marasmus. I am credibly informed that on the march through southern Tennessee to Pittsburg Landing the men generally threw away their overcoats, and as they were usually provided with only one blanket and rubber-cloth, they were often severely pinched by cold at night both before the battle of Shiloh and afterward, until about the tenth of June. These cold nights following the heat and fatigues of marching, trench work, and skirmishing by day, were extremely detrimental to the health of the army, producing obstinate bronchitis, mucous diarrhœa, and remittent fevers.

### *Extract from the Report of* Surgeon JOHN N. BEACH, 40th Ohio Volunteers. *Camp near Prestonburg, Kentucky, quarter ending June* 30, 1862.

The 40th Ohio was organized at Camp Chase, Ohio, and remained there about two months. We left camp December 17, 1861, and went by rail to Paris, Kentucky. We left Paris on the 25th of December and marched to Paintville, the march occupying thirteen days. During the march it rained almost incessantly, so that the troops hardly had their clothing dry during the whole time. Immediately after our arrival at Paintville we made a forced march to Prestonburg and took part in the battle of Middle creek. For three days the troops were without tents, proper food, or medical supplies. As a result of this continued exposure half the regiment was on the sick-list, and many died during the next few weeks from typhoid fever and pneumonia. When I joined the regiment at Piketon, Kentucky, April 19th, there were about fifty cases in hospital, several in the last stage of typhoid fever, and quite a number just brought in with it. The deaths occurring during the next few weeks were from typhoid fever. In March an unusual rise of Big Sandy river overflowed the camp, sweeping away the camp equipage, stores, &c. The flood buried a large quantity of grain (corn and oats) very near the camp, which, I have no doubt, had much to do with the malignancy of the fevers in April. Since the first of June our diseases have been much milder in character. The fevers are of a remittent type, and are readily controlled by quinine. The diarrhœas so general in April and May have disappeared to a great extent, but there has been a considerable increase in the number of dysenteric cases. Fortunately the dysentery up to this time has been mild and easily managed by cathartic doses of castor oil and turpentine, or of the salines, followed by opium and entire rest.

### *Extract from the Report of* Surgeon FRANCIS B. ETHERIDGE, 5th Minnesota Volunteers. *Camp on the Tennessee river, June* 30, 1862.

During the first half of the quarter the 5th Minnesota was stationed at Fort Snelling, Minnesota, where catarrhal affections and measles were the principal diseases. The cases of measles frequently terminated in bronchitis or pneumonia. Nothing worthy of note occurred from the time we left Fort Snelling, May 13th, till we reached the Tennessee river, when diarrhœa became prevalent, and occasional cases of cholera morbus occurred. From the time of our landing at Hamburg to the close of the quarter these diseases became more and more prevalent, particularly diarrhœa, which frequently ran into dysentery. We have had as yet no fatal cases, but several continue to resist treatment. The cases of fever which have occurred have mostly been of the remittent type. The extreme prevalence of diseases of the digestive system is, in my opinion, principally owing to the climate, but also to our mode of life in camp, and perhaps in some measure to the water we use. We are encamped on an elevated piece of woodland, where we have some shade, good drainage, and a good supply of water by digging twenty to forty feet.

### *Extract from the Report of* Surgeon JOHN Y. FINLEY, 2d Kentucky Cavalry. *Savannah, Tennessee, quarter ending June* 30, 1862.

At the beginning of the quarter the continued fevers, from which the 2d Kentucky cavalry had suffered during the winter, were gradually replaced by the remittents common in this region during the warmer months. Diarrhœa also became common. More than half the cases treated were acute diarrhœa, largely due, as I thought, to the extremely wet weather and exposure to the night air without tents. The disease was, however, mild in form and very amenable to treatment. May 1st, we were ordered to our present location. The neighborhood is low, damp, and adjacent to large swamps. The drinking water is impure. Since encamping here our sick-list has been large, remittent fevers and diarrhœas being the prevailing diseases. We have also had an epidemic of mumps.

### *Extract from the Report of* Surgeon AIKEN C. MILLER, 14th Kentucky Volunteers. *Cumberland Gap, Tennessee, quarter ending June* 30, 1862.

During the march of the 14th Kentucky from Lexington to Cumberland Gap our men were almost constantly drenched with rain, and often had to lie at night with their clothes thoroughly saturated, and without blankets enough to keep them warm, the weather during our entire march being very cold. This produced many cases of diarrhœa and catarrh. The dews falling in this region of country at night are equivalent to light showers, and the clothes of the troops while without shelter at night were always saturated. The temperature at night is so much reduced that it becomes intolerably cold toward morning. This is a very great source of diarrhœa and dysentery, as well as various pulmonary troubles, such as bronchitis, pleurisy, and pneumonia.

### *Extract from the Report of the same. Cumberland Gap, Tennessee, quarter ending September* 30, 1862.

While stationed at Cumberland Gap the principal diseases of the 14th Kentucky were diarrhœa, dysentery, jaundice, and other diseases of the digestive organs; we have had, besides, quite an epidemic of low, continued fever, but it was of short duration and proved to be very mild. The treatment which gave most satisfaction in cases of watery diarrhœa consisted in the administration of saline cathartics, followed by mild alteratives and astringents, with total abstinence from food and drink for at least twenty-four hours. Dysentery was also amenable to the same course of treatment, but required less purgation and more decidedly alterative measures.

### *Extract from the Report of* Surgeon S. L. Burdett, 4th Kentucky Volunteers. *Camp near Tuscumbia, Alabama, quarter ending June* 30, 1862.

Diarrhœa has been a very common disease in the 4th Kentucky since about the 15th of December last; in fact it was uncommon to see a soldier that did not have the disease, and strange as it may seem, I have known sauer-kraut or cabbage to check it in many instances where the most powerful astringents had failed. It is very common to hear soldiers affirm that green corn is good for loose bowels. To a limited extent I have noticed this to be the fact; hence I am led to believe that much of the diarrhœa of our army results from a scorbutic condition of the system.

### *Extract from the Report of* Assistant Surgeon Henry P. Fricker, 20th Ohio Volunteers. *Grand Junction, Tennessee, July* 14, 1862.

Among the diseases from which the 20th Ohio suffer, diarrhœa and dysentery still predominate. Their fatality may be said to be great. Some die in the acute stage of the disease, in others it becomes chronic; the latter cases are much the most frequent, and the patients ultimately die of debility with or without diarrhœa; often a slow but increasing fever sets in, emaciation rapidly follows, and the patient either dies suddenly, or lingers a long time baffling every kind of treatment.

### *Extract from the Report of* Surgeon Henry E. Foote, 22d Ohio Volunteers. *Camp near Corinth, Mississippi, quarter ending September* 30, 1862.

Diarrhœa and dysentery have been the prevailing diseases during the quarter, and were often very obstinate. Much benefit has been derived in these cases from saline cathartics in small doses, and from opiates; some that had resisted other treatment have yielded to Fowler's solution and laudanum.

### *Extract from the Report of* Assistant Surgeon Benjamin F. Keables, 3d Iowa Volunteers. *Bolivar, Tennessee, September* 30, 1862.

The cases of diarrhœa that have been troublesome were all contracted while encamped at Pittsburg Landing on the Tennessee river. I attribute them in part, at least, to drinking the river water. Most of the cases of dysentery occurred while we were encamped near a stagnant pond in the vicinity of Memphis. I think malaria has also acted as a cause of bowel complaints.

### *Extract from the Report of* Assistant Surgeon Charles B. Tompkins, 17th Illinois Volunteers. *Bolivar, Tennessee, quarter ending September* 30, 1862.

The 17th Illinois has been stationed during the quarter at Jackson and Bolivar, Tennessee. We moved from Jackson July 16th. We were encamped at both places on high, rolling ground, with good water convenient to the camp. During July we had several cases of cholera morbus, but the prevailing disease was diarrhœa, which, however, was easily controlled by opiates, together with such stimulants as brandy, ginger, camphor, &c. During September diarrhœas have given place to dysenteries, over which opiates and astringents have very little control. I have, however, found the extracts of belladonna or conium, combined with camphor and quinine, to act admirably. We have had two cases of pneumonia, one of them fatal, and quite a number of cases of ophthalmia, nearly all of a purulent form.

The regiment has been employed on light duty during the quarter, with the exception of a march made from this place to Iuka, Mississippi, *via* Jackson, Tennessee. We went by rail to Corinth, and marched thence to Iuka and back. We were gone seven days, and were under cover only two nights. It rained almost every other day. The exposure seemed to cause dysenteries rather than fevers.

### *Extract from the Report of* Surgeon Carr W. McMillen, 1st East Tennessee Volunteers. *Cumberland Gap, quarter ending September* 30, 1862.

The prevalent diseases in the 1st East Tennessee during the quarter have been diarrhœa and dysentery. Some few of the cases were exceedingly intractable, but the majority readily yielded to treatment; in those characterized by bloody stools the saline treatment proved most advantageous, while opium and rest succeeded best in other cases.

### *Extract from the Report of* Surgeon Jared W. Tuttle, 29th Illinois Volunteers. *Camp near Jackson, Tennessee, quarter ending September* 30, 1862.

During the month of July the most prevalent disease was acute diarrhœa. This I think was attributable as much to the carelessness of the men in regard to diet as to anything in the season or locality; they not unfrequently surfeited upon unripe fruit and green corn half cooked. The disease, however, was readily checked by the use of common astringents, subnitrate of bismuth with opium, or Hope's camphor mixture. The number of cases of malarious origin during the month was forty-seven. There was no difficulty in controlling these with quinia.

During August there was a great diminution in the number of cases of diseases of the digestive organs, and in fact a great improvement in the health of the regiment. This I think was in part owing to a march the troops took about the 1st of the month, which lasted fifteen days. There is nothing that has so marked a tendency to improve the health of troops as moving them.

During September there was a great increase in the number of fevers of malarious origin, but a diminution of all other diseases. The regiment was placed along the railroad line about the first of this month, and the localities requiring guards were of a low, marshy character. The consequence was that nearly all the companies suffered with intermittent fever, which, however, yielded to quinia in all cases.

### *Extract from the Report of* Assistant Surgeon Elliott Pyle, 2d Iowa Volunteers. *Camp near Corinth, Mississippi, September* 30, 1862.

The prevailing diseases during the quarter have been mild malarial fever, dysentery, and diarrhœa. Though some of the cases of dysentery have been of a very severe character, none have terminated fatally or become chronic. The treatment pursued in the earlier stages has consisted in the use of saline cathartics, alternated with opiates and the occasional exhibition of mercury. In the later stages opiates and quinia, with castor oil from time to time, and a nutritious and supporting diet were directed. Acute diarrhœa has been the most prevalent disease in the command. This is undoubtedly the result of those irregularities of life and habit which are peculiar to the soldier.

### *Extract from the Report of* Surgeon Alexander H. Hoff, U. S. Volunteers. *Hospital steamer D. A. January, quarter ending September* 30, 1862.

My observations have been confined to the condition of men placed on board this boat for transportation, most of whom have been subjected to treatment and show evidences of its effects. Most of them are suffering with diseases of the intestinal canal; however, in the last two loads there has been more intermittent and remittent fever complicated with diarrhœa. Whether the diarrhœa is a necessary complication caused by the influences of climate, or depends upon treatment, is a matter of much importance. The condition of the mucous membrane, and the history of cases so far as they can be obtained, points strongly to the treatment, especially to carelessness, exposure, and improper diet permitted, or which cannot be prevented, while taking the more potent remedies which our surgeons are in the habit of prescribing—calomel, mercury with chalk, and sulphate of quinia in some proportions seeming to be generally used in all this class of cases. This treatment, so far as my experience goes, cannot be necessary, as very many of these men, as high as fifty per cent., are salivated, yet the fever still persists; while on the contrary, with a proper diet and close attention to avoid everything that would have a tendency to irritate, good effects are at once seen with the smallest quantity of antiperiodics.

Most of the men sick at the present time are from the southern portions of Indiana, Illinois, Ohio, &c., who, if they were so unfortunate as to miss an attack of ague in the fall, would consider themselves in a dangerous condition. These men are being sent to general hospital as rapidly as possible; but I have no confidence that they will be worth anything to the service until next spring, those that have returned being obliged to be sent away again, the fever having reappeared on the slightest exposure.

I have had no experience in reference to prophylactics, but cannot say that I am in favor of the whiskey ration, even as a vehicle for the administration of the sulphate of cinchona.

### *Extract from the Report of* Surgeon William W. Welch, 53d Illinois Volunteers. *District of West Tennessee, October* 1, 1862.

I observed last spring not only that the epidemic diarrhœa which then prevailed in the 53d Illinois could not be readily arrested by any means ordinary or extraordinary; but that even when much protracted it was unattended by the exhaustion which almost universally follows sporadic cases, the men who were its subjects keeping about their duties as usual, with very little perceptible diminution of strength, merely suffering from the inconvenience. I noticed also that in those cases where, by the use of alteratives and astringents, the disease was overcome, either fever in some form or jaundice was the result—jaundice in particular; and even at the present time, although a few cases are serious, I am constrained to believe that the disease is for the most part salutary.

### *Extract from the Report of* Surgeon Franklin Blades, 76th Illinois Volunteers. *Camp on the Tallahatchie river, Mississippi, quarter ending December* 31, 1862.

At the commencement of the quarter the 76th Illinois was stationed at Columbus, Kentucky; shortly after it moved to Jackson, and thence to Bolivar, Tennessee. At Bolivar we remained nearly two months. During October measles prevailed, and remittent fever was common. There were also very many cases of intermittent fever and of mild diarrhœa, which readily yielded to treatment. During November the epidemic of measles subsided, but the number of cases of other diseases, especially those just named, increased. In the latter part of November we left Bolivar and moved south to our present camp, ten miles south of Oxford, Mississippi. Here we have experienced a sudden and considerable increase of sickness. Acute diarrhœa continues to be frequent, and dysentery, typhoid, typho-malarial, and remittent fevers of a grave character are beginning to prevail.

In the treatment of dysentery I have latterly discarded mercurials altogether. In recent cases I invariably begin the treatment with a full dose of sulphate of magnesia, followed, after free evacuation of the bowels, with large doses of ipecacuanha and opium. I do not often have to repeat the sulphate of magnesia. In nearly every instance the disease has been cut short in from twenty-four to forty-eight hours.

### *Extract from the Report of* Surgeon Elias C. De Perry, 46th Illinois Volunteers. *Camp near the Tallahatchie river, Mississippi, quarter ending December* 31, 1862.

On the 4th of October the 46th Illinois left Bolivar, and participated next day in the affair at Matamora, on the Hatchie river near Pocahontas, Tennessee. We had thirty-one officers and men killed and wounded. We returned to Bolivar October 8th, and remained until November 4th, when we marched to La Grange, Tennessee, where we remained till November 28th, when we moved to Waterford, Mississippi, where we arrived November 30th. Here we remained eleven days, after which we went southward and encamped near Yockna station on the Mississippi Central railroad, December 12th. December 22d we marched to our present camp, arriving on the 23d.

The prevailing diseases have been intermittent and remittent fever, diarrhœa, and dysentery. The fevers were caused by exposure in a malarious country, where the men were compelled to sleep in the open air, often getting wet and sleeping in their damp clothes.

The dysenteries were caused, in addition to the above, by the improper manner in which the rations were cooked, and by the use of improper articles of diet. These cases yielded readily to appropriate treatment, so that the patient was seldom kept from duty longer than from three to six days.

The acute diarrhœas were caused by errors in diet and by sleeping on the ground, but on the removal of the causes yielded readily to treatment. We have a few cases of chronic diarrhœa of long standing, most of them having commenced last spring on the Tennessee river, during the months of March, April, and May. The treatment of these cases has been attended with very unsatisfactory results, and it seems almost impossible to relieve them while they remain in camp.

### *Extract from the Report of* Surgeon Joel Morse, 52d Ohio Volunteers. *Edgefield, opposite Nashville, Tennessee, quarter ending December* 31, 1862.

The 52d Ohio left Camp Dennison, Ohio, August 25, 1862, and arrived at Lexington, Kentucky, August 26th. August 30th, we marched to take part in the engagement then progressing at Richmond, Kentucky, but our troops having been defeated before we arrived, the regiment retreated and reached Louisville September 5th. We left Louisville October 1st, and took part in the battle of Perryville October 8th. Subsequently we marched as far as Crab Orchard, and thence *via* Danville to this place, where we arrived November 7th.

During this time we have had a number of cases of fever, principally of malarious origin, and in most cases conjoined with diarrhœa. These fevers, intermittent at first, were apt, if permitted to run any length of time, to assume a remittent or continued form. The most efficient treatment was the free exhibition of quinine and the use of opium and astringents. Just before we reached Edgefield measles broke out, and a considerable number of cases occurred. The first cases were left in hospital at Bowling Green; subsequent ones, with very few exceptions, have been sent to general hospital at Nashville. Many of these patients died in hospital; others, who rejoined the regiment as convalescents, have since died or been discharged; while a number of the remainder, to judge from appearances, will have to be discharged in the future.

We have suffered much from diarrhœa; only slightly, however, from dysentery. The treatment found most efficacious during the first part of the quarter was a combination of quinine and capsicum, with opium and astringents; lately, however, we have preferred to give a dose of castor oil with a few drops of oil of turpentine every third or fourth day, and tonics and astringents on the intermediate days.

### *Extract from the Report of* Surgeon John J. McElroy, 125th Illinois Volunteers. *Nashville, Tennessee, December* 31, 1862.

We have had quite a large number of cases of diarrhœa during the month, but nothing in comparison with the number treated during November. The treatment most efficient has been chiefly opiate, astringent, occasionally alterative.

The form of dysentery which we have had has been readily controlled by a free use of opium and ipecacuanha.

### *Extract from the Report of* Surgeon George W. Phillips, 75th Illinois Volunteers. *Nashville, Tennessee, quarter ending December* 31, 1862.

The 75th Illinois went into the field October 31st, having been in camp for a month previous. Major General Buell's army was ordered to march light during the campaign in Kentucky, and many of the men left their knapsacks, overcoats, and blankets behind. The marches each day were long for raw troops, water scarce and bad in quality, no tents for shelter. Eight days after leaving Louisville the regiment took part in the battle of Perryville, having forty-seven killed and one hundred and sixty-six wounded. After the battle we marched fifty miles to Crab Orchard, Kentucky, exposed at night to a damp, chilly atmosphere, and subjected to new climatic influences. These causes combined produced diarrhœa and bronchitis, the prevailing disorder being a serous diarrhœa.

In the month of November the same disease prevailed, but the proportion of catarrhal affections was greater. The regiment arrived at Nashville November 8th; after this date jaundice and other forms of hepatic derangement became common. There were also many cases of intermittent fever, most of which were complicated with diarrhœa or bronchitis. In many of them the paroxysms were indistinct and the febrile action was not high. Congestion of the kidneys was common in this class of cases.

### *Extract from the Report of* Surgeon Esaias S. Cooper, 83d Illinois Volunteers. *Camp near Fort Donelson, Tennessee, quarter ending December* 31, 1862.

Dysentery and diarrhœa have been common during the quarter. Both have generally terminated favorably when treated with frequent purging by castor oil, followed during the intervals by the free use of opium and ipecacuanha, with stupes to the abdomen applied hot and sprinkled freely with oil of turpentine. The persulphate of iron, acetate of lead, sulphate of copper, nitrate of silver, tannic acid, prepared chalk, and oil of turpentine by mouth and rectum, in various proportions and quantities, have been successfully used in these diseases. The mortality has been less than one per cent.

### *Extract from the Report of* Surgeon Claibourne J. Walton, 21st Kentucky Volunteers. *Army of the Tennessee, quarter ending December* 31, 1862.

During the quarter there have been twenty-one cases of intermittent and remittent fever, two of typhoid fever, forty-three of diarrhœa, and thirteen of dysentery, in the 21st Kentucky. The prevalence of diarrhœa and dysentery is partly due, no doubt, to the deficiency of vegetables, such as potatoes, onions, &c. The remedies I have employed in the treatment of diarrhœa are such as are usually administered, with the addition of a stimulating emetic at the onset of the attack. I begin by giving, in most cases, a mustard emetic, with or without ipecacuanha, aided by large draughts of warm water. This is my favorite remedy, and I can safely say that it relieves at least half the cases without any other medicine. Its beneficial effect in diarrhœa, as well as in cholera morbus, is most remarkable.

Dysentery occurred chiefly in men of weak and debilitated constitutions. It was successfully treated with opium, ipecacuanha, and capsicum, with the free use of whiskey or brandy. Mercurials were seldom admissible.

### *Extract from the Report of* Surgeon Thomas M. Cook, 101st Ohio Volunteers. *Camp near Murfreesboro', Tennessee, quarter ending December* 31, 1862.

The 101st Ohio left Louisville, Kentucky, October 1st, as a part of the Ninth Division, commanded by General R. B. Mitchell, and reached Nashville about the middle of November. When they set out the number of diarrhœa cases was already considerable, and as they had no tents and were much exposed the cases began to assume a grave type, and were complicated by fevers of malarial origin. The latter soon assumed a low typhoid type, and although we had lost but two men up to the 1st of December, yet the daily sick-list was very large. In the treatment of diarrhœa quinine, ipecacuanha, sulphate of magnesia, oil of turpentine, blue pill, opium, and various mineral and vegetable astringents were employed, but the cause being ever at hand the cases either resisted them altogether or continually recurred.

### *Extract from the Report of* Surgeon Martin R. Gage, 25th Wisconsin Volunteers. *Columbus, Kentucky, quarter ending March* 31, 1863.

During the quarter the most common diseases have been diarrhœa and dysentery, remittent or bilious fever, pneumonia, bronchitis, and rheumatism.

Diarrhœa has been the most common affection since the 25th Wisconsin was stationed at Columbus, Kentucky. The fæces are copious, discharged frequently, and are of a liquid or watery character; sometimes the ingesta are thrown off almost as taken into the stomach. Some cases are accompanied with griping pain in the bowels, others are entirely free from it. The tongue is generally furred, but ordinarily there is no fever, except as the consequence of suddenly checking the discharges by improper remedies. Doubtless the principal causes of the complaint are the change from the extreme dry and cold atmosphere of Wisconsin and Minnesota to the more moist and relaxing influences of this region, together with the use of the impure Mississippi and surface waters for drinking purposes.

In the treatment, ordinarily a dose of castor oil is at first prescribed, followed by an opiate, and, if thought advisable, an astringent such as acetate of lead or tannic acid. If this does not prove effectual, the bowels may again be cleared by a mild purgative, followed by an opiate combined with alterative doses of calomel and some form of astringent. The cases treated in quarters were generally found much more obstinate than those in hospital, owing, no doubt, to the circumstance that the diet of the latter can be regulated and controlled better.

Dysentery has prevailed to some extent—frequent and scanty evacuations of mucus and blood being accompanied by more or less tenesmus and griping pains low in the abdomen. Fever is a common symptom, and is often of a very high grade, sometimes assuming a bilious remittent character. The treatment I have chiefly used is as follows: The bowels are moved by castor oil or rhubarb, then as much opium is given every four hours as the system will bear, combined with calomel and ipecacuanha, and this treatment is continued, with the occasional use of mild laxatives. In those cases in which the accompanying fever is clearly of a paroxysmal character, quinine is used in as large doses as the stomach will bear, for the purpose of interrupting the progress of the fever. This effected, the dysenteric symptoms usually very soon subside. In those cases in which there is much tenderness of the abdomen and much tympanites, warm fomentations and counter-irritation by mustard are useful, and at a later period blisters are beneficial. In many cases it is found desirable to resort to the use of injections. I usually make use of acetate of lead or tannic acid combined with laudanum, sometimes of laudanum alone, in a little starch-water. The enemata thus used are small in quantity and frequently repeated.

### *Extract from the Report of* Surgeon JAMES S. WHITMIRE, 6th Illinois Cavalry. *Steamer Lasalle, Yazoo Pass, Mississippi, quarter ending March* 31, 1863.

During the month of January the 6th Illinois cavalry was stationed twenty miles east of Memphis, Tennessee, guarding the railroad. February 13th we moved to the neighborhood of Memphis, and March 3d shipped for our present station. Throughout January and February the prevailing diseases were diarrhœa and dysentery, with intermittent and continued fevers of a low grade. Since embarking we have sent back to general hospital thirty-six men, mostly on account of derangements of the alimentary canal, accompanied by a low grade of fever, which frequently manifests a periodical character, chills or diarrhœa occurring at regular periods. This character of diarrhœa, if left to itself, is almost sure to terminate in typhoid fever.

In my treatment of all these bowel diseases I make use of a small quantity of sulphate of cinchona, sulphate of quinia, or an extract of the *cornus Florida*, (which I have prepared myself at every opportunity,) and they yield very readily to this treatment in connection with opiates, turpentine, &c.

### *Extract from a Report of* Medical Inspector EDWARD P. VOLLUM, U. S. A., *April* 23, 1863.

* * * The surgeons in charge of the hospital transports and floating hospitals inveigh against the character of patients sent to them from the regimental hospitals, many of them dying soon after reception, and sometimes while being conveyed from the ambulances to the boat. They also complain of the number of cases of salivation sent them from the same source. I saw two cases of mortification of the cheek from mercurialization. In both, one side of the head was greatly swollen, and a circular black surface about three inches in diameter occupied the central part of the cheek. Copious discharges of the foul secretions from the mouth rendered approach to the patients sickening.

A number of cases of sudden death have occurred on these boats and in the army of the Tennessee, concerning which I suppose you have received reports. *Post mortem* examination reveals no other lesions than a congestion, passive, doubtless, of the membranes at the base of the brain, and particularly of the medulla oblongata, with copious serous effusion. These sudden deaths have occurred altogether in cases of chronic diarrhœa, and the surgeons think they have noticed a relationship between congestion of the conjunctiva, which has assailed all the cases noted, and the tendency to sudden death, or rather the serous effusion causing it. A case of this kind happened on the steamer on which I took passage up the Mississippi from Memphis. The patient, a discharged soldier suffering from chronic diarrhœa, sat near a hot stove, where the by-standers left him for their breakfast; returning, they found him on the floor dead, with the appearance of having been convulsed. The body presented the emaciated appearance common in diarrhœa. The day previously he had expressed himself better than usual. In the evening, feeling feverish, he drank freely of water; before going to the stove he said he felt better than usual.

### *Extract from the Report of* Surgeon JOHN E. SANBORN, 27th Iowa Volunteers. *Jackson, Tennessee, April* 30, 1863.

During the last month we have had but few cases of continued fever. A number of cases apparently threatening to become serious were speedily cut short with mercurials followed by quinine. The most alarming case was that of Lieutenant B., of company K, who had a violent chill followed by fever of extraordinary severity and duration. This was broken up by the use of quinine, but within forty-eight hours severe pneumonia (congestion?) of the right lung was developed, which in a few hours threatened to be speedily fatal. He was rescued from this imminent danger by the prompt use of blisters, with brandy, carbonate of ammonia, and quinine, and is now convalescent. Nearly all our cases of protracted fever assume a remittent or intermittent form, and seem to demand antiperiodics.

Diarrhœa is less frequent than heretofore, partly from increased care in cooking, all cooking being done in messes and under careful supervision, and partly from the effects of an order prohibiting the sale of pies, cakes, &c., in the camp. Most of the diarrhœas assume primarily the form of hepatic congestion, and are generally speedily relieved at the outset, if opportunely treated with somewhat brisk mercurials, followed with saline laxatives. Most of the catarrhs have been the result of exposure to cold and wet, or have followed measles.

### *Extract from the Report of* Surgeon CHARLES A. HUNT, 126th Illinois Volunteers. *Jackson, Tennessee, April* 30, 1863.

Nearly half the cases of sickness observed in the 126th Illinois during April have been bronchitis and pneumonia, while nearly all the remainder have been dysentery, or malarial fevers complicated with dysentery. The dysenteric cases were quite tractable. Aperient remedies, such as blue pill, sulphate of magnesia, and castor oil, combined with opiates to allay the pain, have been very successful.

### *Extract from the Report of* Surgeon ROBERT J. FARQUHARSON, 4th East Tennessee Volunteers, *to* Medical Inspector FRANK H. HAMILTON, U. S. A. *Near Nashville, Tennessee, June*, 1863.

[Dr. Farquharson reports that some two or three months previously the 4th East Tennessee was vaccinated, ugly ulcers and a troublesome eruption resulting in many cases.] Upon a general examination of the men the following conditions were observed: There was a general complaint of malaise or rather of debility, which prevailed to such an extent and in so marked a degree as to present to a casual observer the appearance of confirmed laziness, the men sitting down even when you were talking to them, and exhibiting, when apparently well, the greatest lassitude and indisposition to duty or exercise of any kind. The

general appearance of the men in the face is not anæmic; they have rather a good, dark, ruddy complexion. Headache is quite common, as are also dyspeptic symptoms, loss of appetite, nostalgia, vomiting, and eructation of food. The pulse, as far as observed, is generally smaller and more rapid than in healthy men. The tongue in almost all cases presents the same appearance—broad, flabby, smooth, and without the slightest appearance of fur, no matter what may be the immediate disease for which the patient presents himself. In a few cases, when the stomach was implicated, the tip of the tongue was red and the papillæ apparent. The gums were found to be preternaturally red, in most instances retracted from the teeth, and inclined to ooze blood upon pressure. Though in many instances pain in the bones was complained of, in none have nodes, or the flatness and hardness of the muscles of the calf of the leg, so often described as a peculiarity of nautical scurvy, been observed. Finally, attention should be called to the most prevalent and the most important consequence of the cachexia present—dysentery. Three causes may be assigned for the dysenteric cases, and probably all had an agency in the production of this disease, viz: Exposure to rain with imperfect protection and sleeping on the wet ground, the use of hard limestone water from a well near by, and, lastly, the scorbutic taint.

This dysentery is of an acute character, with bloody stools from the beginning, and none of the cases present typhoid symptoms; it seems to be more of the nature of bloody diarrhœa; is easily checked by a laxative followed by an opiate, but soon returns, as might be expected, the causes remaining in full force.

The weather since our arrival in Nashville has been cool, with frequent showers. The site of the encampment is flat, too much shaded, imperfectly drained, and has been used by other troops. The latrines being imperfectly filled with earth add much to the offensiveness of the air and somewhat to its insalubrity. The water used is from a well of very hard limestone, kept low by constant use; such water has always been known to produce irritation of the bowels in persons coming from districts supplied with purer water.

## *Extract from a Report of the Inspection of Camp and Field Hospitals of General Grant's Army in the field in the rear of Vicksburg, Mississippi, for the month of June*, 1863, *by* Medical Inspector JOHN E. SUMMERS, U. S. A.

Water for drinking purposes is supplied by springs and recently dug wells, the cistern water having been exhausted; indeed it only lasted a few days. It is hard water, containing lime and magnesia with a large quantity of vegetable matter in solution. It certainly has the effect of inducing diarrhœa. I think I may safely say that one-half or more of the command on duty have been suffering from a very relaxed condition of the bowels. I learn from old residents of this vicinity that the only use made for the last thirty years of the water from this source has been for cooking and washing, cistern water having been substituted even in the large fields for the negroes. * * * *

I regret to say I found some brigades that had been in camp ten days or more and were without sinks or any convenience for the command or even the officers, and a general indifference exhibited by them to this subject. I have endeavored to impress the importance of the subject on the minds of brigade commanders, and have since learned that a better condition of things now exists. Where sinks had been made, they were seldom found attractive for the men; without arbors over them as a general thing, and not unfrequently without a pole to sit on. It was claimed that dirt was thrown into them every evening. Their position was never so far off as it ought to have been, but this was a military necessity. It was also claimed that as rapidly as they were filled they were covered over and others dug. I am impressed with the fact that too much, and indeed an inexcusable, indifference was manifested all the way along the line through the camps, with some very few exceptions, to the importance of proper attention to this subject. I will add that the men have been in the habit of going out into the bushes, and not unfrequently only thirty or forty feet from some of their tents, and relieving themselves; in fact human excrement has been promiscuously deposited in every direction, until the atmosphere, as the dampness of evening and night approaches, is so heavily loaded with the effluvia that it is sickening. * * * *

## *Extract from the Report of* Surgeon EDWIN C. BIDWELL, 31st Massachusetts Volunteers. *Port Hudson, Louisiana, quarter ending June* 30, 1863.

The 31st Massachusetts left Baton Rouge April 1, 1863, for Algiers by steamer. April 9th it went by railroad from Algiers to Berwick Bay, thence marched on the 11th up the Teche. It was engaged in the battle of Fort Beasland April 13th. Continuing its march to Opelousas, Alexandria, and Semmesport, (stopping a few days at each of the places named,) we arrived in the immediate vicinity of Port Hudson May 23d, and were engaged in the siege of that place until the present time, participating especially in the battles of May 25th and 27th and June 14th. Its camps since our arrival here have been in rather dense groves of magnolia, beech, and other large forest trees. The men have been chiefly engaged in skirmishes in rifle pits or other situations exposed to the direct rays of the sun as well as to the fire of the enemy, or on fatigue duty in trenches similarly exposed. The entire loss by battle during the quarter was fifty-eight.

During the quarter I have recorded seven hundred and fifty-three cases of intermittent fever, being an average of nearly nine per day. All these I have considered as having been contracted at Fort Jackson last fall, and look upon them as vernal relapses. They have for the most part been easily managed. Most of them have yielded to a single dose of ten grains of quinine; very few have required more than a second dose. Within the last few days another form of fever has appeared, due, I presume, to exposure to the direct rays of the sun. It is of a mild grade, the most notable and constant symptom being a debility quite disproportionate to other evidences of disease.

We have also had a good deal of diarrhœa, which I have attributed in large measure to drinking water too freely while on the march. The water used was chiefly turbid, and obtained from the bayous communicating with the Red or Mississippi

rivers, which often had a disagreeable taste and odor. With the exception of sulphate of magnesia, which I find indispensable in the treatment of diarrhœa, no single remedy has proved so useful during the last quarter as the infusion of the bark of the sweet-gum tree, (*Liquidambar styraciflua,*) which is abundant everywhere in this region. Many cases assuming somewhat of the dysenteric character are uncontrollable until the patient loses his appetite; under absolute diet they recover readily.

It should also be noted that diarrhœa has been a prominent symptom in most, if not all, the cases reported as continued fever; indeed there is no well-defined boundary between the cases referred to those two titles. One probable cause of the prevailing diarrhœa is the use of unfiltered water of the Mississippi river. By my direction some companies have made arrangements for precipitating the impurities of the river water by the use of alum to render it more suitable for drinking purposes; others are about procuring filters at the expense of their company funds. The results of these expedients remain to be ascertained. Another fruitful source of bowel affections I suppose to be the sale of crude fruits, pastry, and various vile beverages in and around the camp.

### *Extract from the Inspection Report of the Department of the Cumberland for the month of August*, 1863, *by* Medical Inspector Frank H. Hamilton, U. S. A.

I have noticed everywhere in the department that the free use of berries, peaches, and green corn, with other fruits and vegetables, although the fruits were seldom ripe when eaten, has had a salutary effect upon muco-enteric affections. If they have occasionally increased or produced a diarrhœa, they have also cured or prevented many more.

### *Extract from the Report of* Surgeon John C. Welch, 20th Kentucky Volunteers, *in charge of Prison Hospital No. 2, Louisville, Kentucky, for September*, 1863.

Subnitrate of bismuth in large doses seemed to exert as much influence in controlling obstinate cases of chronic diarrhœa as any other single agent in the materia medica. Opium in grain doses, combined with quarter-grain doses of sulphate of copper, is also an admirable remedy, repeated at intervals ranging from two hours to six, according to circumstances. The persulphate of iron combined with an equal quantity of opium constitutes a valuable remedy in acute dysentery.

### *Extract from the Report of the same for October*, 1863.

The subcarbonate of bismuth acts admirably well as a curative agent in chronic diarrhœa. The only two cases we had of that disease yielded promptly to its influence in the short space of forty-eight hours. It acts like a charm. It should be essayed in all obstinate cases, as it has displayed such beneficial results in the few cases in which I have had an opportunity of testing its superior powers.

### *Extract from the Report of the same for November*, 1863.

The subcarbonate of bismuth has displayed its curative powers in the cases of chronic diarrhœa treated during the month. It has been exhibited in doses of fifteen grains repeated at intervals of four hours. The patients have uniformly improved under that treatment in thirty-six hours. It is worthy of a more extended trial, and I would recommend its use in all inveterate cases of chronic diarrhœa.

### *Extract from the Report of* Surgeon James Bryan, U. S. Volunteers. *Opposite Vicksburg, June* 27, 1863.

We found that our diarrhœas and dysenteries, when checked suddenly, were often transformed into remittent and intermittent fevers, and that the morbid impression in the lower bowels was transferred to the stomach. The cases were usually quite severe, though mild ones were occasionally observed. Indeed the prevalent disease of the hospital, in addition to any other the patient might have, was diarrhœa. This was attributable to two causes: First, to the drinking water used; and secondly, to the climate. Something might be added also in reference to the rations, which in the first part of the month were deficient, but were subsequently supplied by authorized foraging parties. * * * During the month the best preventive we found for diarrhœa and dysentery, as well as for a peculiar gastralgia which was common, was the free use of citric acid as a lemonade. By diminishing the coffee ration, getting fresh milk and administering it boiled, and using freely of the citric acid, we cut down these diseases very rapidly. The premonitory symptoms were generally relieved by a free resort to this treatment.

### *Extract from the Report of* Surgeon Victor H. Coffman, 34th Iowa Volunteers, *to* Medical Inspector George W. Stipp, U. S. A. *Department of the Gulf, February* 8, 1864.

The 34th Iowa left St. Louis December 1, 1862, on transports, and arrived at Helena, Arkansas, December 7th. Here it went into camp, suffering at the time from epidemic mumps and measles. December 22d we again embarked to take part in General Sherman's expedition against Vicksburg, leaving in camp one hundred and twenty men unable to go with the regiment. Subsequently we took part in the expedition against Arkansas Post, and returned to St. Louis about the middle of January. June 6th we set out from St. Louis to join the investing force in front of Vicksburg, and took position on the extreme left, resting upon the river. Our camp was situated between the river and the large bayou, and was almost a complete cypress swamp. Here the command suffered severely from malaria, and performed the hardest service, skirmishing, digging rifle pits at night, and doing picket duty. The entire command was on duty every night, which soon disabled the soldiers, leaving them an easy prey to the diseases of the summer. Thus prostrated, they readily succumbed to attacks of dysentery, which became alarmingly

fatal. The only treatment that proved at all successful was, at the outset, to administer from twelve to twenty grains of calomel with an ounce of castor oil, followed by sedative doses of quinine, stimulants, and a nutritious diet. After the first stage, aromatic sulphuric acid was our sheet-anchor.

*Extract from the Report of* Surgeon JOHN W. ANGELL, 23d Wisconsin Volunteers, *to* Medical Inspector GEORGE W. STIPP, U. S. A. *Department of the Gulf, February* 11, 1864.

The 23d Wisconsin landed at Young's Point, Louisiana, about eight miles above Vicksburg, January 24, 1863. Here we went into camp on a low marshy bottom surrounded by cypress swamps, and the ground nearly covered by water. We remained in this encampment until February 14th, and during this time suffered much from miasmatic disease. At one time there was scarcely a well man to be found in the regiment. * * * Diarrhœa and typho-malarial fevers were the principal diseases prevailing, and a large percentage of the cases proved fatal. The diseases contracted at this point are still affecting the regiment, and more than one-fourth of those now daily excused from duty first became diseased at that place; yet the cause of all this was not solely the unhealthy locality of the camp ground, but also the unusual exposure of the men to the inclemency of the weather, their previous long sojourn on crowded transports, their scanty rations, the unhealthy character of their drinking water, all operating upon systems not yet inured to the hardships of a soldier's life.

*Extract from the Report of* Surgeon OTIS E. FRENCH, 114th Ohio Volunteers, *to* Medical Inspector GEORGE W. STIPP, U. S. A. *Department of the Gulf, February* 20, 1864.

The 114th Ohio was mustered in during September, 1862, and went into camp September 20th, near the fair ground at Marietta, Ohio, on the east bank of the Muskingum river. Here dampness and malaria caused much sickness, chiefly diphtheria and intermittent fever. November 29th we embarked on the steamer Izetta for Cincinnati, where we arrived on the 30th, and went on board the steamers Duke of Argyle and Prima Donna for Memphis, Tennessee, where we went into camp December 6th. During our stay measles broke out, and when we embarked, December 20th, we left twenty cases of measles in general hospital. January 2, 1863, we started on the campaign against Arkansas Post, and subsequently proceeded to Young's Point, where we arrived January 23d, and took part in the operations against Vicksburg. August 16th we arrived at Carrollton, Louisiana.

During all this time diarrhœa has been our principal disease. It began to trouble us after a few weeks of camp life. As we proceeded south and the troops were exposed to malaria, it became more grave and frequently ran into hepatic flux. I have hardly observed a true case of acute dysentery such as is so frequently seen in the north. Malaria, indeed, has been the great cause of sickness in the western army, and the exciting cause of many diseases not generally attributed to this agent. The scorbutic agency also, in my opinion, has been another great cause of fatal sickness; it is usually complicated with other diseases, and hence is not always recognized. I have seen many obstinate cases of chronic diarrhœa which immediately improved as soon as the patient was put upon fresh beef or raw onions with proper anti-scorbutic remedies.

*Extract from the Report of* Surgeon MADISON REECE, 118th Illinois Volunteers, *to* Medical Inspector GEORGE W. STIPP, U. S. A. *Department of the Gulf, February* 21, 1864.

The 118th Illinois went on board the steamboat Planet at St. Louis with orders for Memphis, Tennessee, December 2, 1862; from this time until the last of January, 1863, it was confined on transports the greater portion of the time. The water in the river being low, the boats frequently grounded on the numerous sand-bars, and the men had to expose themselves in getting them off. The greater portion of the time flour was issued instead of bread, and no proper means of baking it existed. Altogether, they were in a pitiable condition, confined, when below decks, in an impure atmosphere, or lying on the upper decks exposed to wind and rain. As a consequence they sickened in great numbers. One hundred sick were sent to hospital when we left Memphis December 20th. December 26th we went up the Yazoo river. Here very many of the men suffered with acute diarrhœa, which was attributed to the use of the water of the river. The river was low, and was the receptacle of all kinds of filth, from the great number of troops on board the transports assembled in it; moreover, the Mississippi river was rising and arrested the current of the Yazoo, which made it much worse. After the success at Arkansas Post the scene changed, and the health of the men began to improve immediately after going into camp on shore.

*Extract from the Report of* Surgeon CHARLES V. MOTTRAM, 6th Michigan Volunteers, *to* Medical Inspector GEORGE W. STIPP, U. S. A. *Department of the Gulf, March* 1, 1864.

About the middle of May, 1863, the 6th Michigan arrived before Port Hudson and took part in the siege. After the surrender of the place it remained as part of the garrison until the present date. During all this time chronic diarrhœa has been the most serious of our diseases. It is the result of constant exposure to miasmata and a diet consisting almost exclusively of salt meat and hard bread. Vegetables have been very seldom issued; not on an average over once in two weeks, and fresh beef not more frequently.

*Extract from the Report of* Surgeon WILLIAM BERRY, 7th Kentucky Volunteers, *to* Medical Inspector GEORGE W. STIPP, U. S. A. *Department of the Gulf, April* 27, 1864.

The 7th Kentucky was mustered into service September 22, 1861, and was then known as the 3d Kentucky. Although diarrhœa and dysentery prevailed from the time the regiment was organized, no deaths from these diseases occurred until May, 1862. We had an epidemic of measles in September and October, 1861, and this was followed by many cases of pneumonia and

typhoid fever. November 17, 1862, we embarked at Point Pleasant, Virginia, for Cincinnati, and thence went, still on transports, to Memphis, Tennessee, where we arrived December 1st. After the men had been confined on the transports for some fifteen days, diarrhœa and dysentery prevailed to such an extent that we were compelled to leave about fifty men in general hospital at Memphis. After re-embarking on transports at Memphis for the Yazoo river, diarrhœa continued to increase, and prevailed in the regiment until the 1st of April. It was of a more fatal character than any I had previously seen.

While at Big Black river bridge in May, cases of remittent, typho-malarial, and intermittent fevers became numerous, and continued to increase in frequency during the siege of Vicksburg and until the last of August. Diarrhœa and dysentery also continued to be prevalent, and a number of the chronic cases died. The same condition continued during our subsequent movement to Port Hudson and to Carrollton, Louisiana. During most of the time fresh beef was not issued more than once in fifteen days, and fresh vegetables not oftener than once in twenty. During marches, however, the men were often able to obtain fresh vegetables for themselves, and to this circumstance I attribute the mild character and small number of cases of scurvy. In but few of them were the limbs swollen and spotted as is seen on ship-board. I look, however, upon the fatal form of diarrhœa we experienced as a scorbutic disease, and believe that it is sooner relieved by fresh vegetables than by fermented acids. So far as I have heard from them, nearly all of our men who were discharged for chronic diarrhœa and lived to get home have recovered.

### *Extract from the Report of* Medical Inspector Norton S. Townshend, U. S. A. *Louisville, Kentucky, November* 26, 1864.

There appears to be an opinion prevalent that colored troops suffer more than white troops when strictly confined to the established army ration. My own observations lead me to the same opinion, at least so far as the use of hard bread from thoroughly bolted flour is concerned. Where this is a principal article of diet with those who have not been accustomed to it heretofore it occasions constipation, and is followed by various derangements of the digestive system and often by diarrhœa and dysentery.

### *Extract from the Report of* Surgeon Michael D. Benedict, 75th New York Volunteers. *Santa Rosa Island, Florida, quarter ending March* 31, 1862.

Since the 1st of March we have had a large number of cases of remittent fever, mostly of a mild type, although a few have shown a strong tendency to congestion. It seems like a fever of acclimation, and has been most successfully treated with quinine. Dysentery and diarrhœa have been very common complaints, and have almost invariably been produced by eating excessively or by improper food. Only a few cases of these disorders have proved obstinate and unmanageable.

### *Extract from the Report of* Assistant Surgeon George Clary, 13th Connecticut Volunteers. *New Orleans, Louisiana, quarter ending June* 30, 1862.

The 13th Connecticut volunteers arrived at Ship Island April 12th, after a voyage of twenty-three days from New York. The regiment had been quartered during the winter in a large carriage factory at New Haven. Measles and bronchitis had prevailed extensively, and very many of the men were still suffering with severe coughs and were much debilitated. We had seven deaths on ship-board, five from typhoid fever and two from measles. Immediately after going into camp on Ship Island the general condition of the regiment began to improve; but dysentery soon made its appearance. The evacuations in most cases were bloody, but the disease usually yielded readily to rest and appropriate treatment; it was not generally accompanied with fever or signs of severe inflammation.

### *Extract from the Report of* Surgeon James M. Bates, 13th Maine Volunteers. *Ship Island, Mississippi, for the six months ending June* 30, 1862.

The organization of the 13th Maine was completed December 31, 1861, at Augusta, Maine, where it was encamped on the United States arsenal grounds while organizing, and afterward until February 18, 1862. About the first of December measles broke out in camp, and during that month and the following we had about one hundred and twenty-five cases. The disease was introduced by one of a squad of recruits who arrived in camp at night, and who was found well broken out next morning. In a majority of instances the disease assumed a severe type, and was complicated with congestive inflammation of the lungs and a typhoid state of the system, requiring tonics and stimulants to be used freely. In the uncomplicated cases, where the fever was of the sthenic form, the usual diaphoretic and expectorant plan of treatment was adopted.

During our stay at Augusta the troops were quartered in tents provided with stoves and plenty of dry hard wood, and in my opinion suffered more from over-heated tents and consequent sudden transitions from heat to cold than from cold itself.

On the 18th of February, 1862, the regiment left Augusta by railroad, proceeded to Boston, where it was quartered in Faneuil Hall for three or four days, when six companies embarked on the steamer Mississippi, in company with the 30th Massachusetts regiment, for Ship Island, where they arrived on the 20th of March, with the loss of but one man, after a voyage of delays and accidents. The remaining four companies at the same time proceeded to New York, and embarked on the steamer Fulton for Ship Island, in company with the 12th Connecticut regiment, arriving on the 8th of March, after a short passage and without the loss of a man.

During the remainder of the spring and early part of summer the regiment was in tents pitched upon the damp sand, and without floors. Soon after our arrival at Ship Island diarrhœa became very prevalent, but in most cases yielded quite readily

to alterative treatment followed by astringents, and in some cases by tonics, such as quinine, &c. We had but little dysentery or rheumatism during this time considering the amount of exposure to which the men were subjected.

During the months of May and June we had twenty-five or thirty cases of diphtheria of a very malignant form, which, in a majority of cases, proved fatal in spite of tonic and stimulant treatment with quinine, tincture of the chloride of iron, chlorate of potassa, brandy, whiskey, &c.

Our camping ground on Ship Island was low and sandy, with water within three feet or less of the surface, rendering the tents very damp during the spring months, especially at night.

### *Extract from the Report of the same, Ship Island, Mississippi, quarter ending September* 30, 1862.

During the past quarter six companies have been stationed at Forts Jackson and St. Philip, two companies at Forts Pike and Macomb, and the remaining two at Ship Island, which has been the headquarters of the regiment. During the last half of the quarter the six companies at the two first named forts have all been stationed at Fort St. Philip, and the two companies at Forts Pike and Macomb both at the latter. The chief diseases in that portion of the regiment which has been at Ship Island were diarrhœa of a bilious character, and dysentery. Alterative treatment, followed by astringents and tonics, has been almost universally adopted. Astringents, uncombined with or preceding alteratives, we found almost sure to aggravate the symptoms and protract the recovery. Dysentery has been inclined to assume a typhoid form, and very early required tonics and nourishment freely administered.

The diet of the sick has been very good, as we have been able during the summer to procure from the coast fruits, eggs, chickens, and through the months of August and September a limited supply of vegetables, the good effects of which, both in hospital and in quarters, have been very marked. No indications of malarious influences were observed on Ship Island, and but one or two cases of scurvy occurred, and these began to improve rapidly under the free use of potatoes, onions, and lemon juice.

The prevailing diseases at Forts Jackson and St. Philip have been diarrhœa, intermittent fever, and a few cases of scurvy. The food at these forts has been of good quality, with, however, but a limited supply of vegetables a portion of the time. A large majority of the cases of sickness, especially of intermittent fever, occurred at Fort Jackson. There has not been an unusual amount of sickness either at Forts Pike or Macomb, and no intermittent fever, but a good deal of diarrhœa. River water is used almost wholly by the troops, and at first seemed to be the cause of some of the diarrhœa which prevailed, but no such effect is now noticed. The intermittent fever has generally been of a mild form, yielding in most cases in two days to fifteen grains of quinine given in three equal doses during the apyrexia. After two days two grains twice a day have been given until the appetite and strength returned. To those who were found to be very susceptible to malaria daily doses have been administered, and it has seemed to exercise a prophylactic influence, as those to whom it was regularly administered were less affected than others during its use.

It has been observed that those of our men who had been previously reduced by chronic diarrhœa and other debilitating causes were much more liable to attacks of the chills than those who were stronger. These have been treated with daily doses of whiskey and quinine, together with tincture of the chloride of iron, with seeming good results.

### *Extract from a Report by the same, to* Medical Inspector George W. Stipp, U. S. A. *Department of the Gulf, February* 7, 1864.

The 13th Maine arrived at Ship Island, Mississippi, during March, 1862, and remained there until July, when parts of it were ordered to garrison the forts at the entrance of Lake Pontchartrain and the forts at the mouth of the Mississippi river. In August, 1863, we were transferred to New Orleans. We had no miasmatic fevers on Ship Island, but they prevailed among the companies stationed at the forts, especially at Forts Jackson and St. Philip, where in some months we had nearly five hundred attacks in a command numbering six or seven hundred; quotidian or tertian intermittents were the most frequent types, but there was also a good deal of remittent and a few cases of typho-malarial. Since leaving these forts those who suffered most still continue to have occasional attacks, chiefly mild tertian intermittents. It should be mentioned also that many of our cases of chronic diarrhœa have occurred among those who had for months suffered repeated attacks of intermittent fever, which seemed to have produced a general functional derangement of all the abdominal viscera.

### *Extract from the Report of* Brigade Surgeon Rufus King Browne *on the health of the troops at Ship Island, Mississippi, quarter ending March* 31, 1862.

Numerous cases of diarrhœa and dysentery, complicated with biliary derangement and continued fever, occurred among the troops. These were to be attributed to the brackish character of the drinking water and the want of a due proportion of fresh vegetables in the diet. Many of the cases of diarrhœa became chronic and incurable.

### *Extract from the Report of* Brigade Surgeon Thomas Hewson Bache. *Ship Island, Mississippi, for the month of April*, 1862.

The principal diseases of the troops on Ship Island have been diarrhœa and dysentery, not owing so much to the climate as to the quantity and quality of the food eaten. The increased ration is one probable cause. There is a bakery here, and the bread is issued while too fresh. There are also many sutlers and peddlers of eatables. Latterly there has been considerable increase in such traffic.

### *Extract from the Report of* Surgeon Ezra Read, 21st Indiana Volunteers. *Carrollton, Louisiana, quarter ending September* 30, 1862.

May 1, 1862, the 21st Indiana landed at Algiers, opposite New Orleans, where it remained a month, and from thence was transported to Baton Rouge, Louisiana. During the summer the regiment was constantly on duty in the field. During the month of September the regiment made three expeditions and engaged the enemy twice.

The prevailing diseases have been periodic fevers and disorders of the intestinal canal. In the treatment of fevers of the periodic type I have prescribed the sulphate of quinia freely, dissolved in whiskey or brandy, giving, during the stage of apyrexia, from half a drachm to a drachm in five-grain doses at intervals of two hours. In the treatment of diseases of the alimentary canal I have prescribed drachm doses of sulphate of magnesia every three or four hours, and sustained the system and removed local congestion with quinine when demanded. In the treatment of all diseases, in climates and localities as fraught with malaria as this, quinine must stand preëminent, and rest in the recumbent position with rigid diet are imperatively demanded.

### *Extract from the Report of* Surgeon James G. Bradt, 26th Massachusetts Volunteers. *New Orleans, Louisiana, quarter ending March* 31, 1863.

Malarious fevers have been prevalent during the quarter, and wet days have been followed by an increased number of cases of intermittent fever. The cases, however, have chiefly affected men who had suffered with ague before coming to this city. Next in frequency are the diseases of the digestive system. Acute diarrhœa has been prevalent, produced by exposure to sudden changes of the weather, and also by the great difference in temperature between the nights and the days. Another cause, in my opinion, is the diet of the men. No fresh meat has been issued since the 10th of December, 1862, and the full ration of salt meat is unhealthy in this warm climate. Vegetables have been issued very sparingly, except beans, which are allowed once a week, and are a most fruitful source of intestinal irritation. The number of cases of diarrhœa invariably increases after the use of this article of food. They are prepared for food by boiling, baking, or used in making bean soup. In either way I consider them injurious.

Acute diarrhœa has either been treated with antacids and astringents, such as chalk mixture, tincture of kino, &c., combined with opiates, or by first evacuating the intestinal canal with castor oil and oil of turpentine, followed by opium pills. This treatment, when aided by rest and low diet, generally effects a cure in a few days. There have been also a few cases of chronic diarrhœa. These have almost always succeeded the low grades of malarious fever, and have proved very obstinate. The remedies upon which most reliance has been placed are tonics, aromatic sulphuric acid, which sometimes succeeds admirably, tincture of the chloride of iron, &c. These cases are apt to recur from time to time, and I am convinced that most of those suffering with this disease will never again be fit for active service. Fortunately their number is small.

### *Extract from the Report of* Surgeon Nath. W. Leighton, 173d New York Volunteers, *to* Medical Inspector George W. Stipp, U. S. A. *Franklin, Louisiana, February* 12, 1864.

The 173d New York, which was recruited in the cities of Brooklyn and New York, embarked at Riker's Island, New York, December 7, 1862, and went on transports to Baton Rouge, Louisiana. It has been ever since in the department of the Gulf. Altogether the most prevalent disease has been malarial fever of the intermittent type. This assumed a graver form during the months of July and August, 1863, than at any other period, even those who had but two or three paroxysms being left so debilitated as sometimes to be weeks in regaining their appetite and strength. Many were sent to general hospital, in the majority of whom the disease had assumed a continued type, and should have been reported as typho-malarial. Diarrhœa and dysentery were very prevalent from the 1st of March to the last of August, and forty-two cases of scurvy were reported during August and September. Altogether four hundred and twenty-nine cases of diarrhœa and dysentery occurred during the year 1863. There were also ninety-four cases of rheumatism. The strength of the regiment when it left New York was seven hundred and seventy-four officers and men.

### *Extract from the Report of* Medical Inspector George W. Stipp, U. S. A. *Department of the Gulf, May*, 1864.

The result of observations in this department would show that those who use rations of pork for any considerable time have suffered from diarrhœa more than those who did not make use of it. * * * It has been confidently affirmed by some that diarrhœa, so extensively prevalent in the warm season, in Louisiana particularly, is developed by eating salt pork habitually. Perhaps, were it taken with other meats, or accompanied by a variety and abundance of vegetables, no such manifestations would occur.

### *Extract from the Report of* Surgeon David Wooster, 5th California Volunteers. *Camp Union, near Sacramento, California, January* 13, 1862.

I have treated our cases of diarrhœa with laxatives, followed by anodynes. To those that lasted more than three days under this treatment I gave fifteen grains of blue mass and ten of subnitrate of bismuth at one dose. There has not been a case in which the cure has not been complete. A dose of some mild laxative is sometimes required the second or third day to relieve the constipation which occasionally follows. Neither the bismuth nor the blue mass alone will answer. I have tried each in several consecutive cases without success.

## Section III.

## FATAL CASES OF DIARRHŒA AND DYSENTERY, WITH ACCOUNTS OF THE MORBID APPEARANCES OBSERVED.

This Section will include, as far as possible, all the accounts of fatal cases of diarrhœa and dysentery in which the morbid appearances were recorded, with the exception of the few given in connection with special reports in the last section, and those belonging to the illustrations of the pathological anatomy of these diseases presented in Section IV. These cases have been collected from the monthly reports of sick and wounded, the medical descriptive lists, and the case-books of the general hospitals, which were turned in to the Surgeon General's Office after the close of the war.

The medical descriptive lists were first ordered to be used in 1862. The forms issued were printed on foolscap paper; in the heading blank spaces were left for the insertion of the name of the hospital, number of the ward or bed, name, age, rank, company and regiment of the soldier, nature of the disease or injury, the result and its date; the rest of the sheet was divided into four columns, headed, respectively, date, treatment, diet, remarks as to condition of patient, &c.; the first and third columns were narrow, the second and fourth as wide as the paper would permit. The form is reproduced in the Introduction to the First Surgical Volume, page XVII. On each blank the following note was printed: "Note.—When a patient is first received into a General Hospital, the entries on this descriptive list will be commenced. All important changes in his condition will be noted on it, in ink, from time to time, by the surgeon in charge of the ward. When the patient has been wounded, the date and character of the wound will be stated, the nature of the operation, if any, and, above all, the result. In case of transfer, this list will be sent, through the officer in charge of the transportation, or failing one, by mail, to the surgeon in charge of the hospital receiving the patient. When this medical history shall have been completed, by the cure, discharge, furlough, or death of the patient, it will, with the treatment and result carefully noted, be transmitted directly to the Surgeon General."

The intention was that the medical descriptive list, like the military descriptive list, should accompany the soldier in his movements from station to station. It was supposed that this would answer a useful purpose, by informing the medical officer, to whose care any patient might be transferred, of the previous history of the case. After the termination of cases in death, discharge for disability, or recovery, the descriptive lists were to be forwarded to the Surgeon General's Office, and it was hoped they would form a valuable source of information with regard to the nature and treatment of the diseases of soldiers. These expectations were very imperfectly realized. The multitude of the sick and wounded as compared to the number of medical officers, and the numerous transfers from hospital to hospital, seemed to render it impossible to fill up the descriptive lists for all hospital patients as originally designed. They were never at any time used in all the

hospitals, and even where most extensively employed were only filled up for a small portion of the patients. As a means of informing medical officers of the previous history of cases, they proved a total failure, for they were never sent with any number of the sick from hospital to hospital. They were, however, employed to a limited extent for the purpose of recording brief histories of cases for transmission to the Surgeon General. Some thousand medical cases reported on these blanks are on file in the Surgeon General's Office. The great majority of them are so meager as to have little if any value. A certain number, however, especially those referring to fatal cases in which autopsies were made, are more complete, and these have been selected for publication in this and subsequent chapters.

The medical regulations in force at the commencement of the war directed the senior medical officer of each hospital, post, regiment, or detachment to keep and deliver to his successor a prescription-book, a diet-book, and a case-book.* In the first two the prescriptions and diet ordered for each patient were to be recorded daily. The case-book was reserved for a fuller account of the more important cases. The pressure of other duties, and the contempt of the majority of the newly appointed officers for what it soon became fashionable to call "red tape," led, from the first, to the neglect of the prescription and diet books, which, in most instances, were imperfectly kept, and in many hospitals not kept at all. The case-books, fortunately, were not altogether neglected, though it must be admitted that surgical cases claimed the greater part of the attention bestowed upon them. After the close of the war the Surgeon General ordered that the books and records of the hospitals about to be broken up should be sent to his office for preservation, and among them several hundred more or less valuable case-books were received and are now on file. The original records of very many of the most valuable cases previously reported on the medical descriptive lists and otherwise, were found in these case-books, with numerous other cases which had never previously been reported. Some of these books appear to have been kept with considerable care; others are slovenly, and bear internal evidence that the entries were made by careless subordinates. All have been thoroughly examined, and whatever seemed of value made use of. Where the case was previously reported, the case-book has been preferred as authority, except where there seemed to be some good reason for a different course. All the cases given in this section are derived from the case-books of the several hospitals named, except when it is otherwise specified.

The cases of diarrhœa and dysentery here presented will be grouped by the hospitals in which they occurred; and those belonging to each hospital will be arranged simply in the order of the date of the termination of each case. Originally it was proposed to arrange the cases in groups corresponding to the several varieties of diarrhœa and dysentery, without regard to time or place; but while this plan offered some advantages, it would have scattered the cases collected by individual observers, and would have excluded many cases which are not recorded in sufficient detail to permit them to be classified with certainty. On the whole, therefore, the simpler plan which has been adopted seemed preferable. Whenever it could be ascertained, the name of the medical officer reporting each case is appended to it.

Perhaps it may be thought that many of the cases given are so fragmentary that they might have been omitted with advantage; but even fragmentary reports often serve as

* Revised Army Regulations of 1861, par. 1254.

additional evidence in confirmation of particular facts or opinions, and the editor has considered it his duty to present, as far as possible, all the evidence on record, desiring to give as complete a picture of these diseases as could be drawn from the material at his disposal, and being willing to bear the imputation of having admitted unimportant cases rather than risk the chance of excluding any of value.

The following case is extracted from the case-book of BAXTER HOSPITAL, Burlington, Vermont, Acting Assistant Surgeon Samuel W. Thayer in charge:

CASE 96.—Private Calvin Washburn, company K, 2d Vermont volunteers; admitted February 12, 1864. Chronic diarrhœa. [This man appears on the regimental returns of the 2d Vermont as taken on sick report, January 1, 1864, with chronic diarrhœa. The disease resisting treatment, he was admitted, February 2d, to Emory hospital, Washington, D. C., where he was treated for the same disease, and thence transferred to this hospital.] At the time of admission he was very much emaciated. He stated that he had suffered from chronic diarrhœa about six months, but had improved very much while in hospital in Washington. His pulse was feeble; his tongue pale. Ordered a nutritious diet and stimulants. He apparently continued to improve, and had a good appetite. About midnight, March 29th, the attending surgeon was summoned and found him complaining of a severe pain in the abdomen, respiration hurried, pulse rapid and feeble. Gave quarter of a grain of sulphate of morphia and stimulants. Died March 31st, at 8 o'clock P. M. *Autopsy* twelve hours after death: The cavity of the thorax contained a large quantity of serum. There were pleuritic adhesions on the right side. Both lungs were filled with tubercles. The liver was somewhat softened, and a cyst was found in the lower portion of its right lobe. The colon was extensively ulcerated and nearly eaten through in two places.

The two following cases were forwarded, on medical descriptive lists, from the KNIGHT HOSPITAL, New Haven, Connecticut, Surgeon Pliny A. Jewett, U. S. V., in charge:

CASE 97.—Private Lyman K. Stearns, company D, 14th Connecticut volunteers; age 35; admitted by transfer from Harewood hospital, Washington, D. C., February 12, 1865. Chronic diarrhœa. [The register of the regimental hospital of the 14th Connecticut volunteers shows that this man was admitted to that hospital September, 1863, for acute diarrhœa, and sent to Culpepper Court-House, Virginia, September 24th. He next appears on the register of the hospital of the 2d Division, 2d Army Corps, admitted December 8, 1864; debility. Sent to depot hospital of the 2d Corps, December 15th. The register of the depot hospital of the 2d Corps records him admitted December 15th; remittent fever. Sent to Washington, D. C., January 17, 1865. The register of Harewood hospital, Washington, records him admitted January 18th; chronic diarrhœa. Sent to New Haven February 10th.] The patient had been sick about six months. He was much emaciated, very feeble, and had from four to eight thin stools daily. Was treated with astringents and opiates, tonics, nourishing diet, and stimulants. He gradually sank, and died March 16th. *Autopsy* nineteen hours and a half after death: Rigor mortis slight. Great emaciation. The brain was not examined. The heart and lungs were free from disease. The omentum was a mere sheet of thin membrane with no fat anywhere. The extremity of the vermiform appendix was adherent to the peritoneum just under the umbilicus; there were also adhesions in the vicinity of the caput coli. The sigmoid flexure of the colon was found in the left hypochondriac region. The left kidney was found reposing directly upon the promontory of the sacrum, and its hilum was found upon its upper anterior surface; the renal arteries supplying it came off from the bifurcation of the aorta, and consisted of four branches. The spermatic arteries also were lower down than usual, arising about an inch above the bifurcation of the aorta. The right kidney was normal in size and position. The spleen was very small and corrugated. The liver healthy, but small. The whole extent of the mucous lining of the intestine was soft and thin. In the cæcum and ascending colon there were numerous nearly circular patches of ulceration, and a deposit of pseudomembrane.—Acting Assistant Surgeon W. B. Casey. [Nos. 524 and 525, Medical Section, Army Medical Museum, are from this case. No. 524 is a portion of the colon coated with pseudomembrane, and presenting a few superficial ulcers. No. 525 is the left kidney, with the bifurcation of the aorta and the renal arteries. The hilum of the kidney is situated in the upper part of its anterior surface. From the aorta, at its bifurcation, three arteries go to this kidney, one of which bifurcates, so that four renal arteries enter the substance of the gland—two at its pelvis, the others on its superior edge.]

CASE 98.—Sergeant George H. Brown, company B, 31st United States colored troops; age 22; admitted by transfer from another hospital January 3, 1865. Consumption. This man presented all the signs of tubercular phthisis, and had also a severe diarrhœa. He was put upon the use of cod liver oil and whiskey, and received three or four times a day a pill containing one grain each of sulphate of iron and opium, one-tenth of a grain of ipecacuanha, and one-twentieth of a grain of strychnia. His stomach soon became irritable and rejected all food. He became emaciated, and died April 11th at 11 A. M.—Acting Assistant Surgeon D. L. Daggett. *Autopsy* twenty four hours after death: Body very much emaciated. Brain not examined. The upper lobes of both lungs were thickly studded with tubercles. In the right lung there were three cavities large enough to contain three or four teaspoonfuls of fluid. There were old pleuritic adhesions on the right side, recent pleuritic adhesions on the left side. The left pleural sac was filled with serum. The omentum was observed to be very thin and devoid of fat, but thickly studded with tubercles. The mesenteric glands were enlarged and tubercular. There were a number of tubercular ulcers in the ileum, and the colon was also ulcerated. The liver, spleen, kidneys and stomach presented no unusual appearances.—Acting Assistant Surgeon W. B. Casey. [Nos. 551 and 552, Medical Section, Army Medical Museum, are from this case. No. 551 is a portion

of the ileum taken from just above the ileocæcal valve, on the mucous surface of which are a number of tubercular ulcers. On the peritoneal surface, opposite to the principal ulcer, are several minute tubercles. No. 552 is a portion of the mesentery with several feet of the ileum attached. The mesenteric glands are enlarged. On the peritoneal surface of the ileum are a number of little groups of minute tubercles, which, by transmitted light, are seen to correspond in position to ulcers on the mucous membrane.]

The three following cases were forwarded on medical descriptive lists from the TROY HOSPITAL, New York, Surgeon George H. Hubbard, U. S. V., in charge:

CASE 99.—Private Walter Marshall, company K, 93d New York volunteers; age 38; admitted November 18, 1864. Chronic diarrhœa. [This man was admitted to regimental hospital July 21, 1864, and was returned to duty July 24th. September 3d he was sent to the field hospital of the 3d Division, 2d Army Corps, suffering from diarrhœa. September 15th he was transferred to the depot hospital of the same division at City Point, Virginia, whence, September 19th, he was sent to Washington. September 21st he was admitted to Emory hospital, Washington, D. C., where he was treated for diarrhœa until November 1st, when he received a furlough and went to his home. While on furlough he was taken worse, and was admitted to this hospital.] He stated that he had suffered from diarrhœa for four months. He is now very much emaciated and debilitated; the expression of his face is anxious, there is a hectic flush on each cheek, and the eyes are suffused; pulse small and feeble; respiration 25; skin dry and harsh; tongue coated with a yellowish-white fur. There is total loss of appetite, great thirst, and some nausea. The abdomen is slightly tympanitic, and there is some tenderness over the transverse colon, but no pain. He has ten or twelve dark, offensive dejections daily. From the date of admission this case steadily progressed to a fatal termination. The only apparent improvement under treatment was in the number of the discharges, which became less and less frequent, so that at last he had but about two dejections daily. Forty-eight hours before death a high fever came on. He died December 2d. He was treated successively with pills of blue mass, opium, and ipecacuanha; pills of persulphate of iron, opium, and quinine; aromatic sulphuric acid and laudanum, acetate of lead and opium, nitrate of silver and opium, chalk-mixture, &c.; milk-punch, egg-nog, &c. *Autopsy:* There was an intussusception of the ileum six inches in length. The mucous membrane of the rectum was very much thickened, indurated, and extensively ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon Myron J. Davis.

CASE 100.—Sergeant John Hardy, company I, 125th New York volunteers; age 37; admitted from David's Island, New York harbor, November 30, 1864. Chronic diarrhœa. He stated that five months ago, while on the march to Petersburg, Virginia, he was taken sick with diarrhœa. He remained with his regiment ten weeks, most of the time performing duty. He was then sent to hospital at City Point, Virginia, where he was admitted August 13th, having ten to twelve dejections daily. From City Point he was sent to David's Island, where he was admitted August 25th, and thence to this hospital. He is now very much emaciated and debilitated; the expression of his face is anxious, eyes bright, pulse 90, small and feeble; skin dry and harsh; tongue red, papillæ prominent. He complains of pains in the hypogastric region; his appetite is poor; he has some thirst. There is tenderness on pressure in the right iliac region and along the course of the transverse colon; the abdomen is flat. He has twelve dejections daily, which are dark and offensive. He has pain and difficulty in passing his urine. Ordered ten grains of Dover's powder to be taken at 8.30 P. M., and to be repeated half an hour after. Diet: Boiled milk. December 1st: Condition unchanged. To take five grains of tannin and quarter of a grain of opium four times daily; an egg with an ounce of sherry wine at 10 A. M. and 3 P. M.; fifteen ounces of milk-punch during the day. December 2d: Had eight dejections during the last twenty-four hours. Substitute five grains of citrate of iron and quinia three times a day for the tannin and opium. Diet and wine as before. A drachm of solution of morphia at bed-time. December 3d: Had eight dark, offensive stools during the last twenty-four hours. Treatment continued. December 5th: Did not rest well last night; is despondent; pulse feeble; has some fever; complains of pain in the hypogastric region and over the transverse colon; no appetite; had twelve stools in the last twenty-four hours. Stop the citrate of iron and quinia, and substitute pills containing each three grains of persulphate of iron, one of quinia, and quarter of a grain of opium. One to be taken four times a day. Milk-punch, egg and sherry wine continued. Solution of morphia at bed-time as before. December 8th: Was rather better for a day or two, but is again somewhat worse. Substitute for the pills a chalk-mixture containing tincture of opium and tincture of catechu; renew the citrate of iron and quinia. Morphia at bed-time, and diet as before. December 9th: Is much more comfortable; stools less frequent. Treatment continued. December 10th: Remains comfortable. Treatment continued. December 11th: The diarrhœa is worse again. Complains of severe pain in the umbilical region. Substitute pills containing quarter of a grain each of sulphate of copper and opium and one grain of quinia. One to be taken four times a day. Morphia at bed-time, and diet as before. December 12th: Is feeling better; takes his food; had twelve stools in the last twenty-four hours. Continue the pills, but take ten grains of tannin and one of opium at bed-time, instead of the morphia. December 15th: Had eight stools in the last twenty-four hours. Treatment continued. December 16th: Is not feeling so well; dejections more frequent. Treatment continued. December 17th: Is feeling badly; face sunken, pulse feeble, skin hot and dry; complains of pain in the umbilical region; tongue dry, cannot take food; had fourteen stools in the last twenty-four hours. Treatment continued, with the addition of the following: ℞. Acetate of lead six grains, powdered opium two grains; make two pills. To be taken during the night. December 18th: Is a little more comfortable. Treatment continued. December 19th: Seems to be sinking, can hardly get him to take food; had twelve dark, offensive stools in the last twenty-four hours. Treatment continued. Mutton broth. December 20th: Has severe pain in the umbilical region. Treatment continued. Apply a blister over the seat of pain. December 22d: Is looking and feeling better, takes food, is free from pain; had six stools in the last twenty-four hours. Treatment continued, with the addition of enemata of laudanum. December 23d: Is looking brighter; rested well last night; pulse 90, small and feeble; takes food; had six stools in the last twenty four hours. Treatment continued. December 24th: Six stools in the last twenty-four hours. Treatment continued, with the addition of four grains of sulphate of zinc in each enema. December 30th: Is not feeling quite so well.

did not rest well last night, expression of face a little anxious, features sharp, pulse 90 and feeble, skin warm and moist; complains of pain in the epigastric and umbilical regions; vomited twice last night; takes food and stimulants; had eight dark, offensive stools in the last twenty-four hours. Treatment continued. Apply a blister over the seat of pain. December 31st: Can hardly speak above a whisper, face sunken, eyes rolled up; lies on his back; pulse small and feeble; complains of a smarting pain extending from the fauces to the stomach, tongue dry, cannot get him to take food, vomited four times last night; had fifteen stools in the last twenty-four hours. Treatment continued. January 1, 1865: Is unconscious, extremities cold; seems to be sinking rapidly. Revived somewhat toward evening and regained consciousness. January 2d: Is quite rational this morning, expression of face natural, pulse 90, small and feeble; skin cold; has no pain; is inclined to sleep most of the time; tongue dry and coated; had three stools in the last twenty-four hours. Substitute for former treatment pills containing one grain of acetate of lead, quarter of a grain of opium, and two-thirds of a grain of ipecacuanha; one to be taken every three hours; whiskey. January 3d: Has not had any passage during the last twenty-four hours; left leg and foot œdematous. Treatment continued. Died, January 4th, at midnight. *Autopsy:* Body very much emaciated. The mucous membrane of the ileum looked as though it had been coated with dirty varnish; it was not ulcerated. The mucous membrane of the ascending, transverse, and descending colon and rectum was indurated, thickened, and thickly studded with large ulcers extending from the cæcum to the verge of the anus. The mesentery was highly congested, and the mesenteric glands were slightly enlarged and indurated.—Acting Assistant Surgeon M. J. Davis.

CASE 101.—Private Hiram Longendyke, company F, 7th New York heavy artillery; age 30; admitted December 2, 1864. Chronic diarrhœa. [The records of the field hospital 1st division, 2d Army Corps, show that this man was admitted to that hospital June 25, 1864. The diagnosis was rheumatism. He was thence transferred to the depot hospital of the same division, City Point, Virginia, where he was admitted July 5th—diagnosis not recorded. From thence he was sent to New York harbor, and was admitted to the hospital on Blackwell's Island, August 1st, as a convalescent. August 11th, was sent on furlough for thirty days, and on November 30th he was transferred to the McDougal hospital, Fort Schuyler, New York harbor, where the diagnosis recorded is chronic diarrhœa. December 1st, he was sent to this hospital, and admitted at the date above given.] Acting Assistant Surgeon A. W. Holden reports that he first saw the patient December 7th. He was then much emaciated, his countenance pinched and haggard, his lips parched and dry, the tongue covered with a whitish fur; abdomen sunken and sensitive to the lightest pressure; pulse about 90, weak and irritable. He stated that he had suffered from diarrhœa for a long time. He is using the following prescription, which was ordered to be continued: R. Subnitrate of bismuth two drachms, sulphate of quinia twelve grains, sulphate of morphia three grains; make twelve powders. Take one three times a day. December 11th: The general condition of the patient is unchanged. He has from ten to fifteen dejections daily. The stools are thin, in part slimy, in part feculent, and are accompanied by tenesmus. The patient complains of pain in the left lung. He has a cough and slight expectoration. Continue treatment; also the following cough-mixture: R. Syrup of squill, camphorated tincture of opium, of each two ounces, fluid extract of ipecacuanha one drachm. Take a teaspoonful three times a day. December 20th: The patient appears to be gradually failing. The diarrhœa is worse, and is accompanied by a good deal of tormina. Omit the cough-mixture; continue the bismuth powders; also tincture of the chloride of iron three times a day. The patient continued to grow feebler, and his diarrhœa resisted treatment. December 24th, the case was transferred to the charge of Dr. McLean, who next day prescribed pills containing each a quarter of a grain of sulphate of copper, half a grain of opium, and a grain of sulphate of quinine; one to be taken every four hours. An ounce of sherry wine three times daily. The diarrhœa, however, continued unchecked, and the patient died January 8, 1865. *Autopsy* fifteen hours after death: The large intestine alone was examined; its mucous membrane was thickened, and, in the sigmoid flexure and rectum, ulcerated.—Acting Assistant Surgeon L. R. McLean.

The four following cases were forwarded on medical descriptive lists from the DECAMP HOSPITAL, David's Island, New York harbor. Acting Assistant Surgeon James W. Dickey in charge at the date the first case was forwarded, and Assistant Surgeon J. Sim Smith in charge at the date of the other cases.

CASE 102.—Private Christopher McEnleer, company K, 1st United States artillery; age 26; admitted May 12, 1863. Chronic diarrhœa. [This man was admitted to Armory Square hospital, Washington, D. C., April 22, 1863, with chronic diarrhœa, and sent to New York on May 5th. May 6th, he was admitted to the Convalescent hospital, Fort Wood, Bedloe's Island, New York harbor, whence he was transferred to this hospital at the date above given.] The patient stated that he had been troubled with diarrhœa about eight months. He has now from four to six passages a day. Ordered five grains of extract of logwood three times a day; rice-water for drink. After a week or two, as the diarrhœa continued unabated, injections of laudanum and sulphate of zinc were directed, with the effect of diminishing the stools to from one to three daily. The patient improved in strength and was able to walk out quite frequently. June 15th: Injections continued. July 1st: The stools are again more frequent, although the injections have been given regularly. The patient is evidently failing. Died, July 7th. The injections were continued till the day of his death. *Autopsy:* Some indications of inflammation were found in the right lung and kidney, and also in the posterior portion of the right lobe of liver. The small intestines were found to be much ulcerated. [The condition of the large intestine is not recorded.]—Acting Assistant Surgeon James W. Dickey.

CASE 103.—Private George H. Banker, company K, 118th New York volunteers; admitted November 3, 1863. Chronic diarrhœa. [According to the records of the Hampton hospital, Fortress Monroe, Virginia, this man was admitted to that hospital September 10, 1863, suffering with intermittent fever. October 20th he was transferred to New York, and November 2d he was admitted to Convalescent hospital, Fort Wood, Bedloe's Island, New York harbor, whence he was transferred next day to this hospital.] The first notes were taken November 10th. The patient stated that nine weeks ago he was seized with chills and fever.

and three weeks after, while convalescing, was attacked with profuse diarrhœa, which has lasted ever since. About a month ago he began to be troubled with a cough. He says he was improving somewhat when he went upon the transport to come north, but became worse on the way. When admitted he was very weak and much emaciated. At present his stomach is irritable; his pulse 110 and weak; he has very little appetite; there is dulness on percussion on the right side, with roughened inspiration and prolonged expiration; on the left side some fine rales are heard. Ordered a grain of quinine every three hours. Diet: Eggs, beef-tea, and milk. November 11th: Is very weak, and evidently failing rapidly; pulse 120 and very weak; tongue dry; diarrhœa profuse, with dyspnœa to such an extent that he is unable to lie down. Treatment continued. November 12th: Ordered half an ounce of whiskey and one grain of carbonate of ammonia every hour. He died November 12th, at 12.30 p. m. *Autopsy* twenty hours after death: Body much emaciated. Brain not examined. At the apex of the right lung there were three or four small deposits of tubercle with solidified tissue about them. The left lung was much congested, but contained no tubercles. The heart was normal. The intestines were nowhere ulcerated, though nearly the whole tract was much congested, particularly about the ileocæcal valve. The kidneys were normal.—Acting Assistant Surgeon A. Norton Brockway.

Case 104.—Private John Finnarty, company H, 99th New York volunteers; age 21; admitted November 3, 1863. Bright's disease. The patient stated that he had enjoyed good health until three months ago at Yorktown, where he was taken sick with intermittent fever, which continued about twenty days; while he was convalescing he was attacked with diarrhœa and a severe pain in his left side. The diarrhœa has continued until the present time, averaging four or five passages daily. The pain in the side abated soon. He does not give a clear account of the chest trouble, but mentions that besides the pain he has had dyspnœa and cough for some time. He was sent to Hampton hospital, Fortress Monroe, where he remained, gradually losing flesh and strength until he was transferred to this hospital. [The records of Hampton hospital show that he was admitted September 8th, with intermittent fever, and sent to New York October 30th.] At present he is weak and anæmic; his pulse is frequent and feeble; the stools are loose but not painful; his legs are œdematous. His urine was tested with nitric acid and heat and found to contain albumen. He has also some cough, which does not seem to trouble him very much. November 14th: The cough is more troublesome. On auscultation found total loss of respiratory murmur on the left side, and on the right side coarse rales, sometimes bubbling, were heard both during inspiration and expiration. There is flatness on percussion over the left side except at the extreme apex of lung. On the right side percussion gives nearly normal resonance. The heart-beats are felt on the right side very near the nipple. His diarrhœa continues unchecked. The treatment has consisted, since admission, of quinine and iron, with milk, eggs, and beef-tea; he has also had half an ounce of whiskey every two hours. November 18th: All the symptoms continued unabated; the pulse is 100 and feeble. November 21st: The diarrhœa is very profuse, the dyspnœa urgent; he is evidently failing. November 23d: Applied cups to the chest to relieve pain and dyspnœa. November 24th: The dyspnœa is so great that he tries to sit up, but can only do so a little while at a time; pulse 120 and very weak; legs and face œdematous. Applied turpentine stupes to the chest; half an ounce of whiskey every hour. Died, November 25th. *Autopsy:* The left side of the chest was filled with pus, the quantity being estimated at a gallon. The left lung was collapsed, very small, and firmly adherent to the spinal column and ribs; it was filled with tubercles. The left side of the chest was lined by a pyogenic membrane, which was very firmly adherent to the thoracic parietes. The right lung had small tubercles scattered through its substance. The heart was normal except as to position, being pushed over to the right side. The liver was considerably congested. The kidneys were enlarged and fatty, and their capsules peeled off very easily. [The condition of the intestinal canal is not recorded.]—Acting Assistant Surgeon A. Norton Brockway.

Case 105.—Private Henry Pitsley, company C, 147th New York volunteers; age 21; admitted October 29, 1863. Chronic diarrhœa. [This man was admitted to the field hospital of his regiment in the latter part of March, 1863, and returned to duty some time after; the date is not recorded. He was re-admitted with dysentery May 15th, and is reported returned to duty May 18th. He was again admitted with diarrhœa October 1st, and transferred to the field hospital of the 1st Division, 1st Corps, October 5th. October 11th he was sent to Washington, D. C., and was admitted on the same day to Carver hospital. The diagnosis recorded is chronic diarrhœa. October 28th he was sent to New York, and admitted to this hospital next day, as stated above.] He stated that he was attacked about five months ago with diarrhœa and pain in the side. The diarrhœa was profuse and the pain in the side severe, but he was kept with his regiment until about two weeks ago, when he was sent to Carver hospital, Washington, D. C., whence he was transferred to this place. He is now much emaciated and very weak; pulse frequent and feeble; diarrhœa profuse. He has considerable cough, which he says has troubled him for the last four months. November 3d: The patient appears to be gaining strength; the diarrhœa is somewhat improved, there being but about four passages daily; his appetite also has improved. Ordered half an ounce of whiskey every two hours, and a chalk-mixture containing paregoric and rhatany. Diet: Milk, eggs, and beef-tea. November 12th: Is about out of doors, and seems to be doing very well. Treatment continued, with the addition of half an ounce of cod-liver oil twice daily. November 25th: The patient is still doing well. He has gained some flesh, but the cough and diarrhœa continue, though they are less troublesome than at first; his appetite is good, and he sleeps pretty well at night. Treatment continued. November 30th: For the last day or so the patient has not been so well. He is beginning to lose appetite; his cough is troublesome, and the diarrhœa is again very severe; does not sleep well at night. Directed him to take ten grains of subnitrate of bismuth and one-third of a grain of powdered opium every three hours. December 3d: The diarrhœa still continues; the patient is very feeble. Ordered a pill of lead and opium every three hours; whiskey. He died December 5th. *Autopsy* eighteen hours after death: Rigor mortis well marked; body very poorly nourished. The left lung was tuberculous and firmly adherent to the walls of the chest; its upper lobe was nearly solidified, and riddled with cavities, one or two of which measured an inch in diameter; the lower lobe contained tubercles but no cavities; in the right lung some groups of tubercles were scattered here and there, but there were no cavities. The heart was normal. The diaphragm was firmly adherent to the whole upper surface of the liver. The liver and spleen were normal. About the ileocæcal valve there was marked congestion, and there were deposits of tubercles [?] on the surface of the intestines, but no well-marked ulceration. The mesenteric glands were tubercular; some of them were as large as an inch and a half in diameter. The kidneys were normal.—Acting Assistant Surgeon A. Norton Brockway.

## The three following cases are from the case-book of McDOUGAL HOSPITAL, Fort Schuyler, New York harbor, Assistant Surgeon Havilah M. Sprague, U. S. A., in charge.

CASE 106.—Private Steward D. Middaugh, company C, 109th New York volunteers; age 18; admitted from Washington, D. C., June 22, 1864. Chronic diarrhœa. [The records of Mount Pleasant hospital, Washington, D. C., show that this man was admitted June 15th from the field hospital of the 9th Army Corps, White House Landing, Virginia. The diagnosis on the register is convalescent from typhoid fever. He was sent to New York June 21st, and admitted to this hospital at the date given above.] He stated that he had been sick three months. For three days before death he had clonic spasms, lasting from three to ten minutes at intervals, during which consciousness was interrupted, and the heart's action was hurried, feeble, and irregular. He died August 11th, during one of these spasms. *Autopsy* eight hours after death: The thoracic viscera, liver, spleen, and kidneys were normal. The mucous membrane of the stomach was softened. Both small and large intestines were congested, inflamed, and ulcerated. [There is no record of any examination of the brain or spinal cord.]

CASE 107.—Corporal William C. Hull, company E, 16th Pennsylvania cavalry; age 27; admitted August 7, 1864. Dysentery. [The records of the Cavalry Corps hospital, City Point, Virginia, show that this man was admitted to that hospital July 13th, suffering from diarrhœa. August 5th he was sent on board the hospital transport Atlantic and brought to this hospital.] Treatment: Tonics, astringents, and stimulants; careful diet. Died, August 16th. *Autopsy* seven hours after death: Rigor mortis moderate; body much emaciated. The heart, lungs, liver, spleen, pancreas, and kidneys were normal. The lower half of the ileum and the colon were much congested, inflamed, and thickened; the mucous coat softened and ulcerated.

CASE 108.—Private Edward Sweeney, company C, 48th Pennsylvania volunteers; age 45; admitted August 7, 1864. Diarrhœa. [The records of the depot field hospital, 2d Division, 9th Army Corps, show that this man was admitted to that hospital, August 2d, with diarrhœa; sent on board the hospital transport Atlantic August 5th, and brought to this hospital.] He had been ill about a month; had constant diarrhœa, and a yellow furred tongue. Died, August 17th. *Autopsy* one hour after death: Rigor mortis well marked. The right lung was adherent to the thoracic parietes. The heart was healthy. The liver was normal. The kidneys were large. The mucous membrane of the intestines was congested and ulcerated.

## The next eight cases are from the case-book of WARD HOSPITAL, Newark, New Jersey, Assistant Surgeon J. Theodore Calhoun, U. S. A., in charge.

CASE 109.—Private Philip Soukil, company A, 8th New Jersey volunteers; admitted January 16, 1865. Chronic diarrhœa. [The records of the depot field hospital of the 2d Army Corps, City Point, Virginia, show that this man was admitted December 7, 1864, for chronic diarrhœa. December 12th he was sent on board the hospital transport Connecticut and carried to Washington, D. C. December 13th he was admitted to Harewood hospital; diagnosis chronic diarrhœa. December 24th he was sent to his home on furlough; being too sick to return, he was admitted to this hospital at the date given above, by order of the medical director.] Died, January 17th. *Autopsy* thirteen hours after death: The large intestine alone was examined. In the cæcum and ascending colon the walls of the gut were very much thickened and very vascular, and the same characteristics were observed in the descending colon and sigmoid flexure. The transverse colon was not thickened, but presented some patches of adherent lymph. The solitary glands in the descending colon were much enlarged. No ulcers were found.—Acting Assistant Surgeon Joseph D. Osborne.

CASE 110.—Private Nelson Maloney, company H, 3d New York cavalry. Admitted June 3, 1864. Diarrhœa and incipient phthisis. [The records of the depot hospital of the Cavalry Corps of the Army of the Potomac, City Point, Virginia, show that this man was admitted to that hospital May 16th, with chronic diarrhœa. He was sent to Washington on May 24th. The records of Lincoln hospital, Washington, D. C., show that he was admitted to that hospital May 25th; diagnosis typhoid fever. He was transferred from Lincoln hospital June 2d, and admitted to this hospital at the date above given.] He was ordered to be discharged from service on surgeon's certificate of disability, March 7, 1865, but died March 9th, while waiting for his papers. *Autopsy* ten hours after death: Body emaciated; skin dark and dingy. The lower lobe of the left lung was filled with a dark, purulent fluid, which exuded on slight pressure, leaving small cavities. The left pleural sac contained a quantity of dark pus. The right lung was filled with frothy serum. The heart and pericardium were normal. The blood was dark colored and fluid, no coagula being found anywhere. The stomach and intestinal canal appeared to be normal. The liver was yellow, with a tinge of brown in some parts. The kidneys were anæmic, and increased in size and weight.—Acting Assistant Surgeon Milton Baldwin.

CASE 111.—Corporal William H. H. Vosburg, company F, 16th Wisconsin volunteers. Admitted April 24, 1865, from North Carolina. Varicose ulcers of the left leg. [The register of the regimental hospital of the 16th Wisconsin volunteers shows that this man was treated in that hospital from September 29th to October 3, 1864, for a scorbutic ulcer. The register of the 3d Division hospital, 17th Army Corps, shows that he was admitted to that hospital April 9, 1865—diagnosis ulcer—and transferred to the Foster hospital, Newbern, North Carolina, where he was admitted April 13th; thence he was transferred to this hospital.] Died, May 8th, with symptoms resembling those of typhoid fever. *Autopsy* five hours after death: The heart was in a normal condition. The lungs were congested. The liver was enlarged, soft, and easily torn. The spleen was nearly double its natural size. The transverse and the upper portion of the descending colon were inflamed for a space about six inches in length, the inflammation extending through to the peritoneal covering and involving a portion of the omentum, which was congested. The intestines were distended by a large quantity of thin, yellowish fæcal matter, which was not unusually offensive. Nothing abnormal was found in the small intestine.—Acting Assistant Surgeon E. P. Nichols.

CASE 112.—Corporal Nils Swanson, company D, 57th Illinois volunteers; admitted April 24, 1865, from North Carolina. Chronic diarrhœa. [The records of the regimental hospital of the 57th Illinois volunteers show that this man was treated in

that hospital for chronic diarrhœa during the month of March, 1865. The register of the 4th Division hospital, 15th Army Corps, shows that he was admitted to that hospital April 7th, and sent to Beaufort, North Carolina, April 10th. The records of the Mansfield hospital, Beaufort, show that he was admitted to that hospital April 11th as a convalescent, and transferred to the north April 19.] Died, May 16th. *Autopsy* fifteen hours after death: There was some rigor mortis; body greatly emaciated. The lungs, heart, liver, and kidneys were normal. The large intestine was ulcerated throughout its whole extent. The small intestine was congested. No immediate cause could be found for the sudden death of this man. A lesion of the heart was suspected, but was not found.—Acting Assistant Surgeon E. P. Nichols.

CASE 113.—Private William H. Osborne, company E, 174th Ohio volunteers; admitted April 24, 1865, from Beaufort, North Carolina. Chronic diarrhœa. [The register of the depot hospital of the 23d Army Corps shows that this man was admitted March 14, 1865, with pneumonia, and transferred to Foster hospital March 29th. From the Foster hospital he was sent to the Mansfield hospital, Beaufort, North Carolina, the register of which records him admitted as a convalescent April 4th, and sent north April 19th.] Died, June 8th. *Autopsy* twenty hours after death: Rigor mortis tolerably well marked; skin dingy; body considerably emaciated. The pericardium was greatly distended by a sero-purulent fluid. The muscular substance of the heart was flaccid and pale. Both lungs were dotted with small tubercles, and in the inferior lobes of each was a large abscess with fetid contents. The pleural sacs contained a considerable quantity of fluid similar in character to that contained in the pericardium. The stomach was normal. Both the small and the large intestines were slightly congested and considerably distended. The omentum was healthy. The liver was normal in size, but somewhat congested. The spleen was somewhat enlarged. The kidneys were normal.—Acting Assistant Surgeon William C. Karner.

CASE 114.—Private Cyrenus Giles, company G, 124th New York volunteers; admitted May 29, 1865. Chronic diarrhœa. [The register of the regimental hospital of the 124th New York volunteers shows that this man was treated for diarrhœa during September, 1864. The register of the 3d Division hospital, 2d Army Corps, shows that he was admitted to that hospital September 17th for diarrhœa, and sent to City Point, Virginia, October 22d. The register of the depot hospital, 2d Army Corps, City Point, records him admitted October 22d—diarrhœa—sent to another hospital November 1st. He was carried on the hospital transport Ben Deford to Alexandria, Virginia, where the register of the Fairfax Seminary hospital records him admitted November 2, 1864—chronic diarrhœa—transferred to another hospital April 25, 1865. There is no later record prior to his entry into this hospital.] Died, July 10th. *Autopsy* five hours after death: Emaciation extreme; considerable rigor mortis. The abdomen only was examined. The mucous membrane of the ileum was congested and presented patches of ulceration, but there was no enlargement of Peyer's glands. The mesenteric glands were enlarged. The liver and spleen were congested. The kidneys were fatty. One of the kidneys was surmounted by a body which seemed to be the suprarenal capsule, but was the size of an English walnut, and filled with a reddish-brown gritty substance. [The condition of the large intestine was not recorded.]—Acting Assistant Surgeon E. Holden.

CASE 115.—Private Barnard Ennis, company H, 8th New Jersey volunteers; admitted May 4, 1865. Chronic diarrhœa and bronchitis. [The records of the field hospital of the 3d Division, 2d Army Corps, show that this man was admitted to that hospital March 7th, suffering with chronic diarrhœa, and was transferred to the depot hospital of the same division at City Point, Virginia, March 15th. April 18th he was sent on board the hospital transport State of Maine, and transferred to Washington, D. C. The records of the Finley hospital, Washington, show that he was admitted April 20th—diagnosis chronic diarrhœa—and transferred to Newark, New Jersey, May 4th.] This man died July 25th, of hæmorrhage from the lungs. *Autopsy* same day: Rigor mortis well marked; extreme emaciation. Brain not examined. There was a large cavity in the upper lobe of the right lung, in which a clot showed the point from which the hæmorrhage took place. There was also a very large cavity in the same portion of the left lung. There were slight pleuritic adhesions on the right side, and very extensive ones on the left. The pericardium contained about two ounces of serum. The heart was healthy. The stomach and intestines were nearly normal; the latter showing very little to account for the long-continued chronic diarrhœa from which the patient had suffered.—Acting Assistant Surgeon Joseph D. Osborne.

CASE 116.—Private Evan Everly, company E, 4th Ohio volunteers; admitted from Harewood hospital, Washington, D. C., November 9, 1862. Diarrhœa. This man was convalescent from typhoid fever, but was still suffering from diarrhœa, and was much emaciated. [The register of Harewood hospital shows that he was admitted October 7th, but gives no diagnosis or disposition.] He died suddenly, at 6.15 P. M., December 10th. *Autopsy:* The right lung was healthy; the left lung was bound to the posterior walls of the thorax by firm adhesions. The heart was unusually small and pale; the right auricle and ventricle were almost empty, the left auricle and ventricle full of blood; the tricuspid and mitral valves were thickened and studded with vegetations. The stomach was distended by semi-fluid ingesta; its mucous coat was smooth and of a pale fawn color. The jejunum was intensely congested; the rest of the intestines was rather pale, but otherwise healthy. The liver was normal in size and structure, with the exception of a fissure an inch in length and about four lines deep, near the external border of the right lobe.

The next four cases are from the case-book of BEVERLY HOSPITAL, New Jersey, Assistant Surgeon Clinton Wagner, U. S. A., in charge:

CASE 117.—Private David Delano, company A, 13th Ohio cavalry; admitted September 28, 1864. Chronic diarrhœa. [The records of the depot hospital of the 9th Army Corps, City Point, Virginia, show that this man was treated in that hospital from August 22d to September 26th; diagnosis, acute diarrhœa.] Died, October 2d. *Autopsy:* Body very much emaciated. Nearly the whole extent of the intestine was congested, and there was extensive ulceration in the lower portion of the colon. The blood-vessels of the mesentery were engorged with blood, and the mesenteric glands were much enlarged.—Acting Assistant Surgeon George Johnson.

CASE 118.—Private Charles W. Farnum, company B, 32d Maine volunteers; age 30; admitted October 15, 1864. Chronic diarrhœa. [This man was taken sick with jaundice August 21th, and admitted to the field hospital of the 2d Division, 9th Army

Corps. He was suffering with chronic diarrhœa at the time. August 31st he was transferred to the depot hospital of the 9th Army Corps at City Point, Virginia, still suffering with diarrhœa. October 13th he was sent north to this hospital.] He died very suddenly, October 18th. *Autopsy:* A firm grayish-white clot was found in the left ventricle, extending into the aorta for some two or three inches. [This was supposed by the reporter to be the cause of death.] The glands of Peyer were healthy. Some evidences of chronic inflammation of the colon were observed, but nothing very marked.—Acting Assistant Surgeon J. Howard Pugh.

CASE 119.—Private John Schroeder, company C, 2d Maryland volunteers; admitted October 15, 1864. Chronic diarrhœa. [The records of the depot hospital of the 9th Corps show that this man was treated for chronic diarrhœa in that hospital from September 30th to October 13th.] Died, October 30th. *Autopsy* twelve hours after death: The whole surface of the left lung was bound by old adhesions to the costal pleura. The descending colon presented numerous ulcers, some of them penetrating to the peritoneal coat.—Acting Assistant Surgeon J. Howard Pugh.

CASE 120.—Private Edward Anderson, company D, 2d New Jersey heavy artillery; admitted November 2, 1864. Diarrhœa. [The records of the 2d Division hospital, Alexandria, Virginia, show that this man was treated in that hospital for chronic diarrhœa from October 21st to November 1st, when he was transferred to Judiciary Square hospital, Washington, D. C., whence, next day, he was sent to Beverly.] Died, February 17, 1865. *Autopsy* thirty hours after death: The brain was not examined. The thoracic cavity contained about three pints of fluid. The lungs and heart were healthy, but the latter was remarkably small. The pericardium contained about two ounces of fluid. The liver, spleen, pancreas, kidneys, and bladder were normal. The ascending colon presented evidences of chronic inflammation; in the transverse colon there were several elliptical ulcers varying from one to two inches in length; the descending colon presented a healthy appearance. The mesenteric glands were considerably tumefied.—Acting Assistant Surgeon Franklin Gauntt.

The next three cases are from the case-book of the SOUTH STREET HOSPITAL, Philadelphia, Pennsylvania. At the date of the first case Acting Assistant Surgeon Joseph Hopkinson was in charge, at the date of the two others Surgeon Edward Shippen, U. S. V.

CASE 121.—Private John Bingal, company I, 100th New York volunteers; admitted from Harrison's Landing, Virginia, August 7, 1862. Dysentery. In this case the discharges from the bowels, which at first were very frequent, were checked by the use of acetate of lead and opium. The patient, however, was very much reduced, and a fatal relapse, with copious bloody discharges, took place August 31st. He died September 2d. *Autopsy:* The ileum in the vicinity of the ileocæcal valve was highly congested, and its mucous membrane in many places appeared to be denuded of epithelium. There was no ulceration or enlargement of Peyer's glands. The mucous membrane of the colon was thickened and congested. The mesenteric glands were enlarged and contained a firm, cheesy deposit. The gall-bladder was much distended with bile.

CASE 122.—Private Theodore Porter, company F, 67th Pennsylvania volunteers; age 47; admitted October 12, 1863. Chronic diarrhœa. This man had been a prisoner of war at Richmond, Virginia, for six months, and had suffered from chronic diarrhœa for the last four months. [On his release he was sent to Camp Parole, near Annapolis, Maryland, where the records show that he was treated for diarrhœa from July 26th to August 21st, and again from September 1st to September 5th, when he was transferred to the 1st Division of the Annapolis general hospital. The records of that hospital show that he was treated there for chronic diarrhœa until October 11th, when he was transferred to this hospital.] He was now very much emaciated. Treatment: Quinine, iron, stimulants, and a nourishing diet. October 14th, as the discharges continued to be very profuse, pills of acetate of lead and opium were ordered. October 16th, pills of calomel, ipecacuanha, and opium were substituted for the lead and opium pills. Laudanum enemata were also administered. The patient, however, continued to sink. October 23d, vomiting set in, and he died October 25th. *Autopsy* the same day: The descending colon and rectum were ulcerated, some of the ulcers being almost an inch in diameter. There was also great congestion of the cæcum. The other viscera were normal so far as examined.—Acting Assistant Surgeon Benjamin F. Butcher.

CASE 123.—Private John Leopold, company B, 74th Pennsylvania volunteers; age 67; admitted October 12, 1863. Chronic diarrhœa. This man had been a prisoner in Richmond, Virginia, for over five months. [When released he was admitted, October 2d, to the 1st Division hospital, Annapolis, Maryland, whence he was sent north October 11th.] When received into this hospital he stated that he had been suffering from chronic diarrhœa for over three months. Pills of acetate of lead and opium were ordered, together with milk-punch and beef-tea. October 14th, aromatic sulphuric acid and laudanum were substituted for the lead and opium, and laudanum enemata were ordered. Subsequently nitrate of silver, belladonna and calomel, ipecacuanha and opium, were tried without benefit. October 22d, the patient, who was now very weak, complained of slight pain in the chest. He coughed a great deal. A cough mixture was prescribed, and a mustard plaster applied to the chest. He died October 26th. *Autopsy:* The left lung was very much congested and the bronchial tubes contained a large amount of pus. The descending colon and the rectum were extensively ulcerated.—Acting Assistant Surgeon Benjamin F. Butcher.

The next fifty-eight cases are from the case-book of the SATTERLEE HOSPITAL, West Philadelphia, Pennsylvania, Surgeon Isaac I. Hayes, U. S. V., in charge. In fifty-one of these cases the autopsies were made by Dr. Joseph Leidy, Professor of Anatomy in the University of Pennsylvania. At the time of the organization of this hospital a number of the leading teachers and medical practitioners of Philadelphia volunteered their services

as ward physicians, and accordingly received contracts as acting assistant surgeons. To Dr. Leidy was assigned the task of conducting the autopsies, and a report of the results was forwarded by him, at the time, to the Surgeon General. This report was accompanied by a number of valuable pathological specimens, which have been preserved in the Army Medical Museum. Those of Dr. Leidy's autopsies which are here presented were made between the 5th of August, 1862, and the 18th of February, 1863. The great majority of the patients were sent to Satterlee hospital from the Army of the Potomac at Harrison's Landing, and had contracted their disease in the swamps of the Chickahominy and before Yorktown during the ill-fated Peninsular campaign. It is greatly to be regretted that in most of them no record was made of the symptoms during life. Probably if this had been done several of the cases here reported would have been reserved for the chapter on fever. As it is, all of Dr. Leidy's cases in which the diagnosis of diarrhœa or dysentery was recorded on the hospital register are here presented, with the exception of a few in which the lesions of enteric fever were unmistakable, and a few others in which illustrations have been prepared from the specimens, and which will be reserved for Section IV.

CASE 124.—Private William Vancleve, company C, 8th New Jersey volunteers; age 45; admitted from Harrison's Landing, Virginia, July 30, 1862. Chronic dysentery. Died, August 4th. *Autopsy* next day: The organs of the chest were normal, except a few small spots of atheroma in the mitral valve and the coats of the aorta. The organs of the abdomen appeared normal, except the intestines. The mucous membrane of the ileum was inflamed in patches from a few inches to a foot in length, with the intervening parts apparently healthy. The mucous membrane of the colon was also inflamed, but not ulcerated, the inflammation being most aggravated in the cæcum, descending colon, and rectum.—Acting Assistant Surgeon Joseph Leidy.

CASE 125.—Private Charles Butler, company A, 95th Pennsylvania volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died August 11th. *Autopsy* next day: Age about 40; body much emaciated. Pneumonia of the right lung, except at its apex, all other portions being in the stage of transition to gray hepatization. Pleurisy, with thin pseudomembrane in small patches on the surface of the lung, the lobes of which were likewise agglutinated, but were not attached to the costal or phrenic pleura. Left lung and heart natural. Fatty degeneration of the cortical substance of the kidneys, with a urinary cyst, about an inch in diameter, in the upper part of the left one. The remaining organs of the abdomen appeared normal.—Acting Assistant Surgeon Joseph Leidy.

CASE 126.—Private F. Gillen, company D, 32d New York volunteers; age 25; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died August 13th. *Autopsy* next day: Body considerably emaciated; organs of chest healthy. Stomach, liver, spleen, pancreas, and kidneys natural. Mucous membrane of the small intestine red or inflamed throughout, but in the greatest degree in the ileum; solitary glands of the latter quite prominent. Agminated and solitary glands of both small and large intestine apparently healthy, but rendered unusually conspicuous by the deposit of black pigment; this appeared as fine molecules in the glands of the small intestine; in those of the large intestine it appeared in the same manner, but was mingled with nuclear bodies filled with the pigment, the nuclear bodies apparently being those usually found in the solitary glands, but altered in condition. The mucous membrane in both extremities of the colon was inflamed; in the intermediate portion of the latter it presented small patches, and was generally grayish white, mingled with slate color, and tinged yellowish from bile. The glands of the mesentery were somewhat enlarged; one of them, the size of a shell-bark, was filled with softened tubercular matter.—Acting Assistant Surgeon Joseph Leidy.

CASE 127.—Private James R. Eastman, company I, 5th Wisconsin volunteers; age 56; admitted from Harrison's Landing, Virginia, August 10, 1862. Diarrhœa. Died, August 13th. *Autopsy* next day: Vigorous appearance, and only slight emaciation. The thoracic and abdominal viscera exhibited no perceptible lesions.—Acting Assistant Surgeon Joseph Leidy.

CASE 128.—Private Alpheus Bass, company C, 32d New York volunteers; age 26; admitted from Harrison's Landing, Virginia, August 10, 1862. Diarrhœa. Died, August 14th. *Autopsy* same day: The body was much emaciated. The organs of the thorax appeared healthy. The mucous membrane of the small intestine throughout was of a pinkish cream color, and more or less tinged with bile. The agminated glands were marked with dots of black pigment, but otherwise appeared healthy. The solitary glands were imperceptible by the ordinary mode of examination. The mucous membrane of the large intestine was moderately inflamed, and the solitary glands rendered conspicuous from the deposit of black pigment. The other abdominal organs appeared to be healthy.—Acting Assistant Surgeon Joseph Leidy.

CASE 129.—Corporal Major I. Sanborn, company G, 5th Wisconsin volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Died, August 15th, apparently of debility. *Autopsy* next day: The body appeared about 45 years of age, large, and of vigorous frame, but much emaciated. No anatomical lesion was discoverable in any of the thoracic or abdominal viscera.—Acting Assistant Surgeon Joseph Leidy.

CASE 130.—Private Alonzo Hinckley, company D, 7th Maine volunteers; age 25; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, August 17th. *Autopsy* next day: Body very much emaciated. The heart and lungs were healthy, except that the left lung presented old pleuritic adhesions to the costal pleura. The liver appeared healthy. Such also was the case with the spleen, except that its convex surface presented old inflammatory adhesions. The mucous membrane of the ileum and colon was inflamed; the agminated and solitary glands all contained black pigment; there were no ulcerations.—Acting Assistant Surgeon Joseph Leidy.

CASE 131.—Private William H. Champlain, company H, 17th New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Diarrhœa and rheumatism. Died, August 17th. *Autopsy:* The body was well made, vigorous in appearance, not wasted, and appeared to be about 25 years of age. The heart and lungs were sound, except that the latter presented old pleuritic adhesions to the costal pleura. The liver presented the light-brown mottled appearance which I usually designate as "rat liver." The spleen was healthy, but exhibited a large number of Malpighian corpuscles. The mesenteric glands were much enlarged and of a pale roseate hue. The mucous membrane of the ileum was of a pink rose color; its solitary glands were quite prominent and opaque white; the agminated glands were thickened and opaque white. The mucous membrane of the colon was inflamed, especially at the two extremities, and the solitary glands were large, prominent, and opaque white. Microscopically examined, the Malpighian corpuscles of the spleen, the solitary glands of the ileum and colon, and the agminated glands, together with the mesenteric glands, all appeared to contain the same kind of nuclear bodies, but these were not perceptibly different from those existing in the same positions under ordinary circumstances.—Acting Assistant Surgeon Joseph Leidy.

CASE 132.—Private William F. Royal, company H, 6th Maine volunteers; age 24; admitted from Harrison's Landing, Virginia, August 10, 1862. Diarrhœa and debility—supposed to be convalescent from typhoid fever. Died suddenly, August 19th. *Autopsy* next day: The body, apparently aged about 22 years, was very much emaciated, and the skin of the trunk was somewhat diffusely ecchymosed; there were also bed-sores on the hips. The lungs and heart were natural. There was about a gill of liquid in the pericardium. The liver and spleen appeared natural. The stomach was contracted and empty, and some of the rugæ along its greater curvature were highly injected. The mucous membrane of the ileum was inflamed in patches from a few inches to a foot or more in length; the agminated glands were thickened, and either white or reddened from inflammation, but none were ulcerated, nor did they appear to have been so; the solitary glands were inconspicuous. The mucous membrane of the colon was slate colored, with small red inflamed patches; it also presented a number of large ulcers, extending to the muscular coat; one of the ulcers, within the cæcum, had perforated; the perforation appears to have occurred just previous to death, as it had not given rise to peritonitis, except some injection of the peritoneum in the immediate vicinity of the aperture, in the right iliac fossa. Kidneys natural.—Acting Assistant Surgeon Joseph Leidy. [No. 43, Medical Section, Army Medical Museum, is from this case. The specimen consists of a portion of the cæcum, which presents a number of large, irregular, superficial diphtheritic ulcers, one of which has perforated. The mucous membrane hangs in shreds from the edges of the ulcer.]

CASE 133.—Private Charles Caloney, company B, 34th New York volunteers; admitted July 7, 1862. Debility and diabetes. Died, August 21st. *Autopsy* next day: The lungs were healthy, except a few old adhesions attaching them to the costal pleura. The heart also appeared healthy, except that there existed an old pseudomembrane, about the size of a dime, adherent to the left ventricle near its apex. The pseudomembrane was fringed, the processes being about one-third of an inch in length. The liver appeared of the usual size and consistence, but was livid purple above and slate colored below. The spleen appeared healthy. The stomach was moderately distended with air and liquid food; its mucous membrane was red in small spots, and there was a patch of inflammation about two inches square near the pylorus. The mucous membrane of the ileum was inflamed in patches; its solitary glands were prominent, and the agminated glands were red and inflamed, or were thickened and opaque white. The colon was distended with air; its mucous membrane presented small patches more than usually injected, and its solitary glands were inconspicuous. The kidneys were below the average size, and their cortical substance was much paler than usual, the tint being pinkish cream colored. The microscope presented the usual condition of the granular cells, (*i. e.*, there was no obvious fatty degeneration.)—Acting Assistant Surgeon Joseph Leidy.

CASE 134.—Private Charles Cramer, company K, 104th Pennsylvania volunteers; age 30; admitted from Harrison's Landing, Virginia, August 9, 1862. Chronic diarrhœa. Died, August 22d. *Autopsy* next day: The body appeared to be about 45 years of age, and was exceedingly emaciated. Considerable ecchymosis was diffused over an extent of about six inches in the neighborhood of the scrobiculus cordis. There was a suppurating sinus about four inches long between the scalp, temporal fascia, and frontal bone, extending from the front of the ear above to the right side of the forehead. The bone was not necrosed, and the sore appeared to be the result of a contusion. The organs of the chest were perfectly sound. The liver healthy. The spleen unusually firm, and Indian-red on section. Stomach in pyloric half contracted to an inch in diameter, and in corresponding degree in cardiac half. Small intestine moderately contracted. Ascending and descending colon narrowly contracted; transverse colon distended with air. Inflammation of the ileum and colon, and a number of blackish ulcers in descending portion of latter; no disease of the intestinal glands, except that they contained a deposit of black pigment. Kidneys sound.—Acting Assistant Surgeon Joseph Leidy. [Nos. 63 and 64, Medical Section, Army Medical Museum, are from this case. No. 63 is the stomach, which is contracted to a tube about half an inch in diameter in its pyloric half, and about two inches in diameter at the largest part of the greater curvature. No. 64 is a portion of the descending colon, which is considerably thickened, and presents numerous follicular ulcers, varying in size from mere points to three lines in diameter. A lithograph of this specimen was published in the Catalogue of the Medical Section of the Army Medical Museum, facing page 72.]

CASE 135.—Private Edward Reagan, company F, 9th Massachusetts volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Gunshot flesh wound and diarrhœa. Died, August 22d. *Autopsy* next day: Body apparently aged about 20 years; moderately emaciated. There was a gunshot wound penetrating the outer side of the right thigh which extended beneath the rectus muscle, but did not involve the bone. The right lung was healthy; the left presented old adhesions

to the costal pleura, and was in a recent stage of pneumonic congestion. The heart, stomach, and liver appeared natural. The spleen, externally, presented an unnaturally blue appearance, and was almost black on section, but otherwise appeared normal. The mucous membrane of the ileum was inflamed in patches, and the solitary and agminated glands contained a deposit of black pigment. The ascending and descending colon presented inflammation of the mucous membrane, and the solitary glands contained black pigment. The transverse colon was free from inflammation, but presented a single ulcer about the size of a dime, extending through the mucous and submucous coats. The peritoneum, corresponding to the position of the ulcer, was injected.—Acting Assistant Surgeon Joseph Leidy.

Case 136.—Private Peter Mosier, company K, 6th Vermont volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa and recent pneumonia. Died, August 23d. *Autopsy* next day: Old adhesions of the pleura at apex of right lung and some recent ones at its base. Lower and posterior part of same lung deeply congested, in the stage of red hepatization. Left lung normal. Inflammation of the mucous membrane of the colon.—Acting Assistant Surgeon Lenox Hodge.

Case 137.—Private Franklin Lammundy, company A, 95th New York volunteers; admitted from Harrison's Landing, Virginia, August 19, 1862. Phthisis. Died, August 25th. *Autopsy* next day: Body stout; age about 35 years. There were old adhesions of both lungs to the costal pleuræ. The pericardium was distended with a serous liquid, containing a few thin fibrinous shreds. Attached to the surface of the right auricle were a few small shreds of pseudomembranous matter, and the reflected pericardium was somewhat injected. The left lung contained much mucus and blood. The lower lobe of the right lung, at its inferior part, was in the condition of gray hepatization. The liver appeared normal, but presented a patch of adhesion about the size of the palm of the hand on the convex surface of the right lobe; though not recent, the adhesion, from its being somewhat discolored by blood on the hepatic surface, was probably not an old one. The stomach and spleen presented nothing abnormal. There was no inflammation in the small intestine, but there were small injected patches of the mucous membrane of the ascending colon. All the solitary and agminated glands were dotted with black matter. The blood in all the organs was very liquid, and poured forth freely on making incisions. The kidneys appeared sound, except that the right one presented an ecchymosis on the outer border the third of an inch in diameter and extending inwardly.—Acting Assistant Surgeon Joseph Leidy.

Case 138.—Private James T. Wood, company H, 4th Michigan volunteers; age 26 years; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa and debility of three months' standing. Died August 25th. *Autopsy* next day: Body emaciated; the front of the trunk and thighs exhibiting a diffused ecchymosed condition. Organs of the chest healthy; the lower lobe of the left lung presented an old stellate cicatrix on its convex surface about two inches in diameter. Spleen small, Indian-red on section. Rat liver. Stomach sound. Mucous membrane of the ileum inflamed in small patches; solitary and agminated glands marked by black pigment. Colon contracted, its mucous membrane presenting small inflamed patches, blackened solitary glands, patches of desquamating epithelium, and in the descending portion eight small ulcers.—Acting Assistant Surgeon Joseph Leidy.

Case 139.—Private G. Miller, company D, 33d New York volunteers: admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, August 27th, at 12 M. *Autopsy* ten hours after death: The body, apparently aged about 21 years, was much emaciated, and the skin of the trunk presented diffused ecchymoses. Heart with an ecchymosed spot at base of right ventricle in front, but otherwise natural; the left side was empty, the right contained only some liquid blood. The lungs, of a roseate hue generally, contained a number of isolated nodular masses of effused blood about the size of shell-barks, some of which had a white central nucleus; besides these, the lungs presented a somewhat congested character at their lower part. The liver, rather small, presented the minutely mottled appearance of red and brown, which I denominate "rat liver;" the tissue of the organ exhibited some fatty degeneration. The gall-bladder was unusually large, extending two and a half inches in advance of the anterior edge of the liver. Spleen small, red on section, but apparently healthy. Stomach distended with air and liquid; softening of the mucous membrane, submucous coat, and muscular coat in the greater part of the left half, so that the wall was reduced to the utmost tenuity, and ruptured on the feeblest traction. The ileum presented the anatomical peculiarity of numerous valvulæ conniventes extending to the ileocolic valve: inflammation of the mucous membrane of the ileum continuously throughout, but with patches of greater intensity; solitary glands few, containing black matter; agminated glands generally healthy, except that some were reddened with inflammation—none contained black matter. Mucous membrane of the colon inflamed throughout, with many small ulcers and patches of desquamating epithelium in the lower part, solitary glands blackened.—Acting Assistant Surgeon Joseph Leidy.

Case 140.—Private William Burrows, company E, 5th Wisconsin volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Diarrhœa. This man was attacked with fever and diarrhœa last April at Yorktown, but continued to do duty until he arrived with the army in the swamps of the Chickahominy, when he entered the regimental hospital, and has been sick ever since. At the date of admission he was much emaciated, but complained of no pain or uneasiness. The stools were thin, watery, and yellow, but contained no blood. There was no fever at any time. The tongue was glazed, and studded with dirty white patches; pulse 80; the skin of the body and face of a dirty dark appearance. At first tannin, chalk-mixture, and other astringents were administered, but without benefit; then equal parts of laudanum and tincture of ergot were substituted; dose, ten drops after each passage. Quinine and beef-tea were also administered. Under this treatment the patient improved for a few days, and then relapsed. Pills containing one grain of opium to two of acetate of lead were next directed to be taken every four hours, but did not seem to agree with the patient so well as the laudanum and ergot, which was renewed August 23d. At this date the patient was weak, and emaciation was progressing rapidly, but his appetite was still good. August 25th, the diarrhœa was reduced to three discharges daily; pulse 88. All medicine was discontinued, and beef-tea and brandy ordered to be freely administered. August 27th, pulse 96; tongue glazed, but no fever; the diarrhœa has quite

ceased, and the stools appear consistent, but the patient is dull and disposed to sleep; the pupils contracted, the cornea hazy. Died, August 31st.—Acting Assistant Surgeon Wm. S. Halsey. *Autopsy* next day: Body apparently about 23 years of age, much emaciated; skin of the trunk considerably ecchymosed, especially about the epigastric region. Right lung with a few nodular masses of condensed tissue about the size of a hickory-nut; these masses presented the appearance of the red hepatization of pneumonia; the remainder of the pulmonary tissue was healthy. Heart small, without fat; the right side containing a yellow fibrinous clot. Stomach moderately contracted; its mucous membrane grayish, with one or two small red inflamed patches. Spleen with old adhesions on the convex surface, otherwise as usual. Liver with old adhesions on the convex surface of the right lobe, cicatrix-like, or stellate in appearance. (Were these old adhesions of the spleen and liver due to inflammation consequent upon a strain, of which the patient complained some months previous to his entering the hospital?) The surface of the liver was brown above, slate-colored below; the tissue was healthy in aspect. Inflammation of the mucous membrane of the ileum, with patches of same of greater intensity; agminated glands with a large quantity of black pigment deposited in the follicles; solitary glands inconspicuous. Inflammation of the mucous membrane of the colon, with patches of greater intensity, accompanied by thickening and desquamation of the epithelium in the descending portion; there were also a few ulcers in the latter, several of them apparently cicatrizing.—Acting Assistant Surgeon Joseph Leidy.

CASE 141.—Corporal Paul Grauvet, company D, 1st New Jersey volunteers; age 24; admitted from Harrison's Landing, Virginia, August 9, 1862. Diarrhœa. Died, August 31st. *Autopsy* next day: Body emaciated, and in an unusually advanced condition of decomposition. Organs of the chest sound. Recent peritonitis; all the viscera agglutinated with pseudomembrane, and the intervals occupied with an abundance of sero-purulent liquid. Liver, spleen, and stomach healthy. Inflammation of the mucous membrane of the ileum and colon; thickening of the upper agminated glands and ulceration of the lower ones; no less than three, near the ileo-colic valve, presented perforations. There were also a number of ulcers in the colon, and a large one was very near the condition of perforation; the solitary glands were thickened, and contained black pigment.—Acting Assistant Surgeon Joseph Leidy. [Nos. 232 and 233, Medical Section, Army Medical Museum, are from this case. No. 232 is a portion of the ileum presenting three ulcers, the largest of which is about two-thirds of an inch in length, and is apparently the result of typhoid destruction of a Peyer's patch. From the appearance of the edges of this ulcer, it would seem that the healing process had commenced. The other ulcers are much smaller, but present similar characteristics. No. 233 is a portion of the colon, which presents a number of oval ulcers and one large irregular one, all penetrating to the muscular coat. It seems probable from the specimens that in this case dysentery had supervened on typhoid fever.]

CASE 142.—Private George W. Beckwith, company E, 16th New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, September 1st. *Autopsy* next day: Body, apparently aged about 20 years, emaciated; the skin of the trunk in an ecchymosed condition. Apex of the right lung with old pleuritic adhesions and deposits of tubercular matter; apex of left with tubercular deposit about the size of a walnut, including several small abscesses; remainder of the lungs healthy. Heart without fat, contracted, the right side containing a white fibrinous clot. Liver and spleen normal. Stomach with diffused inflammation of the mucous membrane. Intense inflammation of the mucous membrane of the ileum; black deposit in the agminated and solitary glands. Inflammation accompanied with thickening of the mucous membrane of the ileo-colic valve, cæcum, vermiform appendix, part of ascending colon, descending colon, and rectum; black deposit in all the solitary glands; a small patch of inflammation and two ulcers in the transverse colon. Kidneys normal, except that they each presented a slate-colored patch, which extended into the tissue of the organs the depth of two lines.—Acting Assistant Surgeon Joseph Leidy.

CASE 143.—Sergeant Ransom Bush, company K, 4th Michigan volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, September 4th, at 4 A. M. *Autopsy* seven hours after death: Age about 40 years; body extremely emaciated; skin ecchymosed. Heart without fat, natural size; valves perfect; both sides contained white fibrinous clots, continuous with black ones, extending into the pulmonary artery and aorta. Two-thirds of the base of the upper lobe of right lung was in a condition of gray hepatization, and presented pleuritic adhesions on its surface; the apex of the same lobe, the middle and inferior lobes, and the left lung were healthy. Liver and spleen natural. Stomach with diffused inflammation extending from the cardiac orifice along the lesser curvature into the pylorus. Mucous membrane of the ileum with small patches of moderate inflammation; agminated glands with black deposit, but otherwise healthy; solitary glands enlarged in the inflamed patches, but elsewhere healthy. The ileo-colic valve, cæcum, and portion of the ascending colon, a small patch in the upper part of the descending colon, the sigmoid flexure and the rectum were intensely inflamed, very much thickened, and covered with small patches of pseudomembrane and desquamated epithelium; intervening spaces of the colon healthy.—Acting Assistant Surgeon Joseph Leidy.

CASE 144.—Private Ezekiel Van Brocklin, company A, 5th Wisconsin volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa and scurvy. Died, September 4th. *Autopsy* next day: Age about 25 years; body slightly emaciated. Heart of normal appearance, containing white fibrinous clots in both sides. The lungs presented the remains of pneumonic induration, and also exhibited a few old pleuritic adhesions. The liver presented old adhesions on the convex surface of the right lobe. Spleen normal. Stomach moderately distended with air, bile, and mucus—acute gastritis—a large intensely inflamed patch at lower part about the middle, and a less degree of inflammation at the two extremities. Some of the valvulæ conniventes of the duodenum inflamed; inflammation also of the mucous membrane of the ileum, with two patches of greater intensity. Slight inflammation here and there of the mucous membrane of the colon, especially in the cæcum. Agminated and solitary glands blackened.—Acting Assistant Surgeon Joseph Leidy.

CASE 145.—Private Patrick Purcell, company E, 49th New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Debility accompanied with diarrhœa. Died, September 8th, at 11 A. M. *Autopsy* next day: Apparent age about 45 years; extreme emaciation. Both lungs with old pleuritic adhesions, but the organs themselves healthy. Heart

flabby; right ventricle contained a small white clot. Spleen lake-red on section. Liver somewhat enlarged and fatty. Stomach and intestines distended with air. Inflammation in patches in the ileum; its glands healthy. Inflammation of cæcum and sigmoid flexure of colon; a less degree in rectum, and a feebler degree in ascending and descending colon; there were also a number of small ulcers about the size of a pea in the sigmoid flexure and rectum; solitary glands with black deposit, but otherwise healthy. Kidneys healthy.—Acting Assistant Surgeon Joseph Leidy.

Case 146.—Private William Roberts, company C, 33d New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, September 13th. *Autopsy* same day: Age about 25 years; body not wasted; no ecchymosed appearance of skin. Lungs healthy. Heart with several opaque fibrinous spots on ventricles the size of a half dime; it contained only liquid blood. Liver dull-brown, apparently healthy; gall-bladder small, and contained about a table-spoonful of mucous, viscid bile. Spleen natural. Kidneys large but natural. Stomach moderately dilated, nearly empty, with general moderate diffused inflammation of mucous membrane; the redness in closely arranged spots the size of mustard-seed. Inflammation in patches in ileum; one patch, pretty high up, about three inches long, gangrenous, extending to peritoneum; intense inflammation of ileocolic valve; the agminated glands healthy, except a few reddened with inflammation; solitary glands healthy. Moderate diffused inflammation throughout colon, increased in degree in the cæcum and rectum; no ulcerations, and solitary glands healthy.—Acting Assistant Surgeon Joseph Leidy.

Case 147.—Private B. B. True, company B, 3d Vermont volunteers; admitted August 9, 1862. Anasarca and chronic diarrhœa. [The regimental records of the 3d Vermont volunteers show that this man was excused from drill on account of fever June 3d; next day he was admitted to the regimental hospital, and the case threatening to be serious, he was immediately transferred to the division hospital, where he recovered, partially at least, and was returned to his regiment, though at what time is not known, as the records of the division hospital are not on file. He appears again on the regimental records as excused from drill July 6th, and admitted to the regimental hospital the same day, the diagnosis recorded being scurvy. He is reported sent to general hospital July 25th, probably the division hospital, as the register of the Satterlee hospital reports him admitted from Harrison's Landing, Virginia, at the date given above.] Died, September 14th, at 5 A. M. *Autopsy* next day: Aged about 30 years; body exceedingly emaciated. Lungs as bright in color as those of a new-born child; a few old adhesions, but otherwise healthy. Heart natural, contained a white clot in the left auricle, and another occupied the pulmonary artery. Liver dull purple. Spleen lake-red on section, and natural in size. Stomach with general diffused inflammation, the injection appearing in small but closely associated maculæ. Kidneys natural. Patches of inflammation in the ileum; agminated glands slightly thickened, and contained black matter. Intense inflammation of the ileo-colic valve, the cæcum, the lower extremity of the colon, and the rectum; the latter presented, on the summits of its rugæ, white patches of desquamating epithelium; solitary glands of colon blackened.—Acting Assistant Surgeon Joseph Leidy.

Case 148.—Private Oliver F. Kellner, company E, 33d New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa and debility. Died, September 15th. *Autopsy* next day: Age about 23 years; body much emaciated; ecchymoses on chest and abdomen. Lungs and heart healthy. Liver, spleen and kidneys healthy. Stomach with inflammation of mucous membrane and softening of the cul-de-sac. Inflammation of the jejunum and ileum, increasing in intensity in descent; enlargement of solitary glands in lower part of ileum, and inflammation of agminated glands generally. Inflammation at both extremities of colon intense, with a slight degree in the intervening portion; the solitary glands of the colon enlarged and containing a black deposit, besides which there were a number of scattered black spots about the size of pepper-corns throughout the tract of the colon.—Acting Assistant Surgeon Joseph Leidy.

Case 149.—Private Peter Dixon, company H, 17th New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa and debility. Died, September 17th, at 7 A. M. *Autopsy* twenty-seven hours after death: Age about 30 years; body much emaciated; skin of trunk and extremities much ecchymosed. Heart healthy, but wasted; without white clots. Lungs with a few nodular masses of congested and somewhat condensed tissue about the size of shell-barks, but otherwise healthy. Liver dull-brown above, slate-colored below, apparently healthy. Spleen, pancreas, and kidneys healthy. Right suprarenal body with brown cortical substance and grayish medulla; left one with cortical substance yellowish externally, but brown internally, and medulla grayish. Stomach with acute inflammation around cardiac orifice and in cardiac half of the organ; in less degree around the pylorus. Inflammation of the ileum extending pretty high up, with patches of greater intensity below; agminated glands slightly thickened, and all bright-red from inflammation; solitary glands all surrounded by bright-red circles. Moderate inflammation throughout tract of colon, but most marked at the extremities—in neither, however, intense; the solitary glands with a small amount of black matter; there were also a few scattered spots of black matter about the size of pepper-corns, especially in the ascending and descending colon.—Acting Assistant Surgeon Joseph Leidy.

Case 150.—Private Eli Lombard, company K, 6th Vermont volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, September 18th, at 1.30 P. M. *Autopsy* next day: Apparent age 20 years; slight emaciation; skin of trunk and thighs with purpura. Recent pleuro-pneumonia of left lung; right lung healthy. Heart somewhat flabby, with a white clot in the right ventricle. Liver apparently sound, dull-brown above, slate-colored below. Spleen natural. Stomach distended with air and a small quantity of liquid; inflammation extending some distance around the cardiac orifice, and softening of cul-de-sac. Intensely inflamed patches in the ileum, with intervening healthy surfaces; agminated glands healthy, except that they contained black pigment; solitary glands natural, except at lower end of ileum, where they were enlarged and inflamed. Intense inflammation, accompanied with desquamation of epithelium of ileo-colic valve, cæcum, and ascending colon; moderate inflammation here and there in course of descending colon and rectum; no ulcerations; solitary glands black; suprarenal bodies and pancreas healthy. Kidneys with pinkish cream-colored cortical substance, the cells of which exhibited, beneath the microscope, a much greater quantity of oil globules than usual.—Acting Assistant Surgeon Joseph Leidy.

CASE 151.—Private Carl Doerlinger, company E, 20th New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, September 21st, at 10 A. M. *Autopsy* next day: Apparent age 32; body extremely emaciated; the skin exceedingly ecchymosed, especially over the region of the liver. Right lung with old adhesions to the costal pleura; recent congestion in both lungs, which were black on section, but everywhere pervious to air; in both there were a few calcified, dry, and chalky tubercles about the size of peas. The black bronchial glands contained calcified deposits. The heart exhibited the remains of an old pericarditis by granular roughness of the right auricle and an attachment between the front of the right ventricle and the pericardial sac. Liver dull-brown, with slate-colored patches below, and slate-colored spots on section about the size of a dime; in both lobes there were several white firm tumors the size of shell-barks; these, beneath the microscope, exhibited a fibro-plastic character. Gall-bladder distended with about five ounces of bile. The spleen, rather larger than usual, was black on section. The lymphatic glands at the head of the pancreas were enlarged and contained dry, chalky deposits; the mesenteric glands, somewhat enlarged, were inflamed, but contained no abnormal deposits. Kidneys presented nothing unusual; the suprarenal bodies were brownish on section, with a dark-brown medulla. Stomach with characters of gastritis; the inflammation occupied the middle portion and extended from the small curvature downward in front and behind; the mucous membrane also presented recent ecchymosed spots. Inflammation of the duodenum and jejunum, extending to a less degree in the commencement of the ileum, which, at lower part, appeared entirely free from it—the very reverse of what has been so repeatedly observed in our former examinations; there were fifty conspicuous agminated glands, besides a number of small ones about one line in diameter; all of them, together with the solitary glands, contained black deposits. Intense inflammation in the cæcum, and six small patches of less violent inflammation along the course of the colon, the intervening spaces being slightly inflamed or healthy; solitary glands healthy and without black deposits. Testes hard and irregular, the right one being much enlarged; both affected with sarcocele; the right one presented an accumulation of bloody pus upon the surface; on section the natural tissue appeared marbled with a homogeneous yellowish-white substance, which, beneath the microscope, exhibited the fibro-granular structure of fibro-plastic matter; it contained a number of fat granules, which probably gave rise to the yellowish color, and indicated fatty degeneration.—Acting Assistant Surgeon Joseph Leidy. [Nos. 17, 18, and 19, Medical Section, Army Medical Museum, are from this case. No. 17 is the right testicle, and No. 18 the left. Both are tubercular; in the anterior and inferior portions of the right are a number of cheesy nodules, in the inferior portion of the left two rather large ones. No. 19 is a group of bronchial glands filled with calcareous concretions.]

CASE 152.—Corporal J. L. Blake, company I, 7th Maine volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Diarrhœa. Died, September 23d, at 8 A. M., of diphtheria. *Autopsy:* Apparent age about 30 years; body good looking, vigorous, and not wasted. The fauces and pharynx to the commencement of the œsophagus, the larynx, trachea, and bronchi were inflamed and lined with pseudomembrane; the tissue of the lungs was healthy, but the bronchial tubes were filled with mucus; some blood was effused into the interlobular connective tissue; the apex of the right lung was tied by an old pleuritic adhesion. The heart was healthy. The liver, spleen, pancreas, and kidneys were healthy. The stomach exhibited evidences of gastritis, and was more or less inflamed throughout. The mucous membrane of the duodenum, jejunum, and ileum was slightly reddened and stained with bile; the large intestine was exceedingly contracted, and was nearly uniformly pink throughout.—Acting Assistant Surgeon Joseph Leidy. [No. 12, Medical Section, Army Medical Museum, is from this case. The specimen consists of the posterior portion of the tongue, with the larynx, trachea, and commencement of the bronchial tubes. The air-passages are laid open posteriorly, and are lined by a diphtheritic layer, which hangs in shreds.]

CASE 153.—Private George M. D. Dustin, company E, 2d Vermont volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa and debility. [The regimental records of the 2d Vermont volunteers report this man admitted with diarrhœa July 28th, and sent to general hospital August 6th.] Died, September 24th, at 10.30 A. M. *Autopsy:* Apparent age about 19; body much emaciated, with petechiæ on chest and abdomen. Old adhesions to right lung throughout; the left free, and both healthy. Heart natural, with a white clot in the right ventricle extending into the pulmonary artery. Liver bright reddish-brown, with the acini very distinct—rat liver. Spleen and pancreas natural. Mucous membrane of the stomach inflamed, with several patches of greater intensity, and accompanied by softening. Inflammation of the ileum, patches of greater intensity toward the middle and declining above and below; enlargement of solitary glands, which, together with the agminated glands, contained black matter. Two patches of inflammation in the ascending colon, with moderate diffused inflammation elsewhere; black solitary glands. Kidneys healthy. Suprarenal bodies, on section, purplish-brown, the cortical substance being of a slightly lighter hue.—Acting Assistant Surgeon Joseph Leidy.

CASE 154.—Private Jefferson Brown, company F, 7th Maine volunteers; admitted August 10, 1862. Chronic diarrhœa. Died, October 8th. *Autopsy:* Apparent age about 27 years; much emaciated; skin slightly ecchymosed. Organs of the chest healthy. Liver dull brownish-purple, on section brown; gall-bladder large and distended. Spleen flabby, remarkably bloodless, on section bright lake-red. Pancreas, kidneys, and suprarenal bodies natural. Continuous inflammation throughout the small intestines, commencing feebly in the duodenum and gradually increasing in intensity in the descent. The ileum was of a deep maroon color, without any destruction of epithelium; the muscular and subserous coats of the ileum were likewise considerably injected. Intense inflammation of ascending colon; transverse colon nearly free; the descending colon, sigmoid flexure, and rectum in a moderate degree inflamed, here and there ecchymoses. Agminated glands not perceptibly altered, nor did they contain the black pigment so frequently observed in other cases. Solitary glands exceedingly numerous, or unusually conspicuous from enlargement; those of the colon appeared natural, and only a few contained black matter.—Acting Assistant Surgeon Joseph Leidy. [Nos. 237 and 238, Medical Section, Army Medical Museum, are from this case. Both are portions of the ileum, the latter taken from a point nearer the ileo-cæcal valve than the former. In both the solitary glands are enlarged to the size of pin-heads and the villi somewhat hypertrophied. In No. 237 there is a small slightly thickened Peyer's patch; in No. 238 is a much larger Peyer's patch, also slightly thickened, and presenting a mammillated surface.]

CASE 155.—Private Charles H. Reed, company D, 18th New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, October 15th. *Autopsy* same day: Apparent age about 30 years; emaciation very great. The lower lobe of the right lung and the lower part of the upper one were affected with pneumonia and slight pleuritic inflammation; the middle lobe and apex of the upper were perfectly healthy. Left lung healthy. Heart natural in size and structure; both ventricles contained large white clots extending into their arteries of exit. Liver brown, somewhat mottled with brownish-buff, but apparently healthy. Spleen small, lake-red on section. Stomach, pancreas, and kidneys sound. Moderate diffused inflammation of the ileum, a greater degree in the cæcum and ascending colon, and small moderate patches in the sigmoid flexure. Solitary glands of the ileum enlarged to the size of yellow mustard-seed and reddened with inflammation; those of the colon containing black matter; agminated glands containing black matter, but otherwise healthy.—Acting Assistant Surgeon Joseph Leidy.

CASE 156.—Private Job M. Chubbuck, company G, 49th New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. Died, October 14th. *Autopsy* next day: Apparent age about 30 years; body much emaciated. Organs of the chest, liver, and stomach healthy. Spleen small, lake-red on section. The small intestine persented four intussusceptions; its mucous membrane was continuously and intensely inflamed, excepting in the duodenum and commencement of the jejunum. The large intestine was extremely contracted, not being more than one inch in diameter throughout, except at the cæcum and four inches of the ascending portion, which were about two and a half inches in diameter; it contained considerable hardened clay-colored fæces. The mucous membrane was inflamed throughout, but most intensely in the ascending colon. Solitary and agminated glands contained black matter.—Acting Assistant Surgeon Joseph Leidy.

CASE 157.—Private Daniel Læduc, company A, 5th Vermont volunteers; admitted August 10, 1862. Diarrhœa. Died, October 23d, at 10.30 A. M. *Autopsy* five and a half hours after death: Age apparently about 25 years; body exceedingly emaciated. Heart natural. Right lung with old adhesions at the apex, the posterior part infiltrated with blood and serum and devoid of air, the anterior part healthy; upper lobe of left lung with old pleuritic adhesions, the back part of the lower lobe infiltrated as in the right lung. Extreme contraction of the intestines; a single intussusception about the commencement of the ileum; inflammation from the stomach to the anus; the solitary glands of the small intestine were quite conspicuous, and appeared as numerous dark-red spots as large as pin-heads. Mesenteric glands enlarged, many of them containing creamy-white matter and yellow pus. Spleen quite small, lake-red on section. Liver brown and apparently healthy; gall-bladder full of bile. Pancreas and suprarenal bodies normal. Kidneys large, and pale on section, with pale cortical substance.—Acting Assistant Surgeon Joseph Leidy.

CASE 158.—Corporal Thomas Malia, company B, 31st New York volunteers; admitted August 10, 1862. Chronic diarrhœa. [The records of the regimental hospital of the 31st New York volunteers show that this man was admitted to that hospital for diarrhœa July 31st; August 5th, the diagnosis remittent fever and incipient scurvy is recorded; August 7th, fever. There is no later entry on the regimental records.] Died, October 24th, at 9 P. M. *Autopsy* next day: Apparent age about 25 years; very much emaciated, and skin of trunk and thighs ecchymosed, as in Chickahominy diarrhœa cases. Right lung with adhesions of the upper lobe, the apex tuberculous, and with a cavity about the size of a walnut; the remainder of the right and the left lung healthy. Effusion of serum into the pericardium. Heart normal in size and external appearance; right ventricle with a white coagulum about as large as a filbert; left ventricle with the walls dark reddish-brown, and the mitral valve thickened one line at the free border. Stomach with some inflammation at the pyloric end. Liver dull purplish-brown; gall-bladder large, and distended with bile. Spleen very small, pale and flabby; on section pale Indian-red. Kidneys dark-red on section, the medullary portion pale. Bladder distended with a quart of urine, and extending four inches above the pubis. No stricture of the urethra. The ileum exhibited traces of patches of inflammation, and the cæcum and ascending colon exhibited traces of inflammation, as if the case had been one of Chickahominy diarrhœa. The capillary vessels were not congested, but the large vessels were engorged; there were a few ecchymosed spots in the colon about the size of a dime. Solitary glands of the ileum healthy, those of the colon containing black matter; the agminated glands were remarkably few, and also contained the black deposit.—Acting Assistant Surgeon Joseph Leidy.

CASE 159.—Private Valentine McSherry, company C, 3d Vermont volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. [The records of the regimental hospital of the 3d Vermont volunteers, Harrison's Landing, Virginia, show that this man was admitted for diarrhœa July 29th, and sent to general hospital August 7th. A note on the register says: Excused from drill July 24th.] Died, November 3d. Note of Dr. Leidy: Apparently of debility, while considered convalescent from Chickahominy diarrhœa. *Autopsy* same day: Apparent age about 22; extreme emaciation. Heart and lungs healthy, the former with a small white clot in the right ventricle. Small intestines for the most part quite healthy in appearance; the ileum presenting traces of the usual inflammatory patches so common in the Chickahominy diarrhœa cases; the solitary glands white, and the agminated glands in the same condition, except the lower ones, which still contained black pigmentary matter in globular molecules up to particles the size of blood corpuscles. The cæcum was inflamed, and contained a quantity of fragments of chicken bones from food; there was also more or less inflammation irregularly diffused throughout the colon, increasing in intensity in the rectum. Spleen, liver, and pancreas apparently healthy. The kidneys likewise appeared healthy, but both pelves contained a small quantity of calculous matter. The mesenteric glands were somewhat enlarged, and white in color; the enlargement being due to a great increase in the corpuscular elements. The blood presented nothing peculiar, both kinds of corpuscles appearing in the usual quantity.—Acting Assistant Surgeon Joseph Leidy.

CASE 160.—Private Oliver P. Smith, company K, 102d New York volunteers; admitted September 26, 1862. Diarrhœa. Died, November 14th, at 7.30 A. M. *Autopsy* the same day: Apparent age about 20 years; body exceedingly emaciated; skin of trunk ecchymosed. The patient was apparently convalescent from Chickahominy diarrhœa. Right lung healthy; left healthy, except the lower half of the upper lobe, which appeared to have been the seat of recent and active inflammation, as it

contained a multitude of purulent foci, and was adherent by plastic matter to the pleura costalis. The heart was excessively emaciated, but otherwise healthy; it contained no clots, but yellow clots occupied the arch of the aorta and the pulmonary arteries. Liver dull-brown, hard, and small; gall-bladder full of bile. Spleen round, but containing little blood. Stomach and intestines contracted; the small intestine with traces of former inflammation. The colon was inflamed throughout, and patches of pseudomembrane were adherent to its mucous surface; these were composed of fibrinous matter mingled with corpuscles resembling those of pus and epithelial cells. Solitary and agminated glands contained black deposit. Blood thin, with diminished number of corpuscles, but white and red ones in the ordinary proportion. The ecchymosed spots, examined with the microscope, appeared to be a staining of the dermis with the coloring matter of the blood corpuscles.—Acting Assistant Surgeon Joseph Leidy.

CASE 161.—Private Tennent R. Spencer, company D, 4th Michigan volunteers; age 35 years; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa. The patient was much emaciated, and had frequent loose stools. Treatment: Astringent enemata, astringents and opium internally, milk-punch freely, milk diet, &c. He gradually failed, and died November 25th, at 6.30 A. M. *Autopsy* same day: Body extremely emaciated; left lower extremity œdematous. Slight adhesions of the apex of the right lung; both lungs otherwise healthy. Heart healthy. Liver soft and fatty. Stomach with subacute inflammation of the mucous membrane. A moderate degree of inflammation of the ileum, with traces remaining of more acute patches. Inflammation throughout the colon, with a few superficial ulcers and small irregular patches of pseudomembranous matter adhering. Spleen bloodless. Mesenteric glands slightly enlarged. Pancreas, kidneys, and suprarenal bodies healthy.—Acting Assistant Surgeon Joseph Leidy.

CASE 162.—Private Jacob Walsh, company K, 2d United States infantry; age 21; admitted August 10, 1862. Typhoid fever. Died suddenly, December 10th, at 5 P. M., of pneumonia. *Autopsy* next day: Body inclined to be fat, with no signs of emaciation. All the vessels of the head, chest, and upper extremities were engorged with liquid blood, which flowed freely on incision through the scalp. Brain healthy. The heart somewhat enlarged, filled with blood and large white clots. Pericardium contained about a teacupful of serum. Both lungs in a state of pneumonic congestion, leaving very little of the tissue pervious to air; an advanced stage of pleurisy also, with adhesions on both sides to the costal pleuræ. Liver large, pale, but not fatty. Stomach healthy. Spleen pale. Kidneys healthy. Suprarenal bodies discolored and dull-brown throughout. Pancreas healthy. The intestines exhibited traces of inflammation in patches, such as accompanies the chronic diarrhœa of Chickahominy cases. Solitary glands of small intestine enlarged; agminated glands with small patches of black deposit. Solitary glands of large intestine intensely black.—Acting Assistant Surgeon Joseph Leidy.

CASE 163.—Private Thomas Kelley, company A, 124th New York volunteers; admitted December 12, 1862. Diarrhœa. The patient was not confined to bed. On the 18th he was moving about, and in the evening ate his supper with other patients. The same night he was slightly delirious. Died, December 19th, at 11 P. M. *Autopsy* next day: Body not emaciated; apparent age about 28 years. Upon the body, especially the thighs, there were a number of irregular spots of purpura from the size of a flea-bite to that of a dime. The blood was very liquid, and poured forth from incisions of the skin and all the internal organs. The brain was examined, but exhibited no unhealthy marks. Pleuritic adhesions throughout, on both sides, of not very old date. Left lung crepitant, but engorged with a bloody liquid. The upper lobe of the right lung hepatized; the lower lobes congested. There was slight atheroma throughout the course of the aorta. Liver soft, Indian-red in color, and large. Spleen large, flabby, and on section dark Indian-red; its convex surface exhibited the remains of a former inflammation. Stomach, pancreas, kidneys, and suprarenal bodies healthy. Small intestine pink in color; the agminated glands thickened, and mostly bright-red in color; the lower glands were a line in thickness, and contained a white cellular deposit; none of them were ulcerated. Mesenteric glands somewhat enlarged. Mucous membrane of the large intestine dirty slate colored, with streaks of inflammation here and there. In a later examination of the removed viscera several growths of connective tissue, hardened by calcareous deposits, were found attached to the end of the vermiform appendix.—Acting Assistant Surgeon Joseph Leidy. [Nos. 88 to 92, Medical Section, Army Medical Museum, are from this case. Nos. 88, 89, and 90 are successive portions of the ileum, in each of which is a large thickened Peyer's patch; the coats of the ileum are very thin. In No. 90 the patch is remarkable for its great size and the pultaceous character of the thickening; there are also several enlarged solitary follicles in this specimen. No. 91 is a portion of the cæcum with the appendix vermiformis, at the extremity of which are several tumors of connective tissue, which are hardened by calcareous deposits. No. 92 is a perpendicular section of the left lung, with pleuritic adhesions on its surface, and partial hepatization of the lower lobe.]

CASE 164.—Private Charles Frink, company D, 68th New York volunteers; admitted from Washington, December 18, 1862. Diarrhœa. Died, December 21st. *Autopsy* next day: Body slightly emaciated; chest and abdomen with a few spots of purpura; feet œdematous, swollen, and purple; an ulcerated bubo in the groin; sordes on the lips, teeth, and tongue. Brain, heart, and lungs healthy. Stomach and liver healthy. Spleen pale and somewhat soft. Kidneys healthy. Small intestine rather bright pink throughout; the lower part of the ileum inflamed, the last two feet intensely; solitary and agminated glands enlarged and inflamed, the degree of enlargement increasing in the descent of the intestine; in the lower two feet of the ileum the solitary glands were enlarged to the size of pepper-corns, and most of them presented a central ulcer; the lower agminated glands were also exceedingly enlarged, and the lowest superficially ulcerated. The large intestine was dark slate color, with streaks and patches of inflammation throughout.—Acting Assistant Surgeon Joseph Leidy.

CASE 165.—Private Lewis A. Wood, company E, 20th Michigan volunteers; admitted December 13, 1862, from the army of the Potomac. Chronic diarrhœa. Died, December 26th. *Autopsy* next day: Apparent age about 22 years; body rather emaciated; spots of purpura on the trunk. Recent pleurisy on both sides, most marked on the right side, and especially at the back part, where there was a considerable quantity of pseudomembrane; the lower lobe of the left lung was covered with a thin pseudomembrane, but the pleurisy did not extend upon the upper lobe. Pneumonia, with condensation of the lower lobe of the right lung, and lobular pneumonia of the upper lobe. Pneumonia of the lower lobe of the left lung, with condensation,

except at the anterior inferior edge, which was free from inflammation; lobular pneumonia of the upper lobe of the same lung. Inflammation of the bronchial mucous membrane. Liver enlarged, measuring twelve inches by seven and a half, and three and a half; firm, reddish-brown on the surface, but deeper red at the back part of the right lobe, mottled with red points; on section the lobuli presented a brownish-drab color, with thick, dark-red centres. Spleen large, seven and a half inches by five and three; firm, with marks of an old inflammation at the lower part. Moderate inflammation diffused through the ileum and colon. Enlargement of the solitary glands in patches here and there in the lower part of the ileum; slight thickening and reddening of the agminated glands. Slight enlargement of the solitary glands of the large intestine, but with no black deposit.—Acting Assistant Surgeon Joseph Leidy. [Nos. 107 to 109, Medical Section, Army Medical Museum, are from this case. Nos. 107 and 108 are successive portions of the ileum, in which the solitary follicles are enlarged to the size of small shot; each piece exhibits an apparently healthy Peyer's patch. No. 109 is the enlarged spleen described above.]

CASE 166.—Private Edward Campbell, company C, 43d New York volunteers; admitted from Harrison's Landing, Virginia, August 10, 1862. Diarrhœa. December 1st there was less diarrhœa, but the patient suffered from anorexia, and was weak and scorbutic in appearance. December 10th there was but little diarrhœa, but great prostration and increasing emaciation; the eyes were sunken, and he presented the peculiar look common in fatal cases of Chickahominy diarrhœa. Died, December 29th, at 7 A. M. *Autopsy* same day: Apparent age about 30 years; body exceedingly emaciated; spots of purpura on the trunk. Heart and lungs healthy. Stomach with a streak of inflammation along the lesser curvature, but generally healthy. Liver small, rather bright reddish-brown, firm; gall-bladder absolutely empty. Spleen small, Indian-red on section. Pancreas and kidneys healthy. Slight inflammation in small patches, with a few ecchymoses here and there, in the ileum. Cæcum filled with impacted boiled eggs; the mucous membrane dark-red, and with a few small blackened ulcers. Slight diffused inflammation through the colon; a few small patches of greater intensity, and a number of superficial ulcers. Lower part of sigmoid flexure and rectum intensely inflamed, red with blackish spots, and a multitude of small ulcers extending into the submucous tissue. No disease of the intestinal glands; only a few of the lowest agminated glands containing a small quantity of black deposit.—Acting Assistant Surgeon Joseph Leidy.

CASE 167.—Corporal Reuben Smith, company B, 6th Maine volunteers; age 40; admitted November 13, 1862. Chronic diarrhœa after remittent fever. Died, December 29th. *Autopsy* four hours after death: Body exceedingly emaciated; lower extremities œdematous, especially the left one. Heart healthy. Both lungs attached throughout by old pleuritic adhesions; the right lung was healthy, except that it contained in its apex a cavity about the size of a walnut; left lung for the most part healthy, there being several condensed masses of tissue, indicating lobular pneumonia, in the back part of the lower lobe. Mucous membrane of the stomach exceedingly pale—the cavity contained a quantity of milk-punch. Liver with old adhesions of the upper surface; the tissue somewhat fatty in appearance, being yellowish-brown and soft. Spleen, with old adhesions on the convex surface, small, and on section pale. Pancreas and kidneys healthy. The small intestine appeared healthy. The mesenteric glands were all enlarged, many of them to the size of pigeons' eggs, and were filled with soft, pasty, tuberculous matter. Large intestine with moderate diffused inflammation, accompanied with small patches here and there of greater intensity; these patches were covered with shreds of pseudomembrane and desquamated epithelium. The lower part of the sigmoid flexure and rectum were intensely inflamed, and coated with pseudomembrane and desquamated epithelium. The mucous membrane of the colon was exceedingly soft, and presented a number of follicular ulcers.—Acting Assistant Surgeon Joseph Leidy. [Nos. 110 and 111, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the descending colon, with irregular patches of pseudomembrane on the mucous surface, and a few small follicular ulcers.]

CASE 168.—Private Richard Goggin, company E, 22d Massachusetts volunteers; age 25; English; admitted December 18, 1862, from Harewood hospital, Washington, D. C. Phthisis pulmonalis. Died, December 31st. [This man is recorded in the register of Harewood hospital, admitted November 19, 1862—bronchial catarrh—transferred to Philadelphia December 17th.] *Autopsy:* Body not much emaciated; skin waxen; no spots of purpura. Recent pleurisy, with pseudomembranous attachment throughout, on both sides. Extensive tubercular deposit of recent origin throughout both lungs, besides a few old tubercles, together with several small cavities the size of filberts, at the apices of the lungs. Bronchitis; enlargement of the bronchial glands. Heart soft and flabby, and easily lacerable; its cavities distended with currant-jelly-like clots. Liver soft, but otherwise apparently normal. Spleen of medium size, with condensation and blackening of portions of its structure, as evidences of former inflammation. Stomach, pancreas, and kidneys normal. Lymphatic glands of the abdomen generally somewhat enlarged through an increase of the corpuscular element. Tuberculous deposit, accompanied with ulcers, in the lowest agminated glands. Most extensive ulceration of the mucous membrane of the cæcum. A few small tubercles here and there in the walls of the much-contracted colon. Ecchymosed spots here and there in the ileum, and small irregular patches at the ascending and terminal portions of the large intestine.—Acting Assistant Surgeon Joseph Leidy. [No. 86, Medical Section, Army Medical Museum, is from this case. The specimen consists of the lower extremity of the ileum and part of the cæcum. A large Peyer's patch just above the ileo-cæcal valve, and several of the solitary follicles of the ileum are ulcerated. In the cæcum there are a number of irregular excavating ulcers, with thickened overhanging edges.]

CASE 169.—Private Samuel S. Snyder, company K, 132d Pennsylvania volunteers; age 21; admitted from Fairfax Seminary hospital, Virginia, December 16, 1862. Typhoid fever. [The records of Fairfax Seminary hospital show that this man was admitted December 13th—diagnosis chronic rheumatism—and was transferred to Philadelphia December 15th.] Died, January 9, 1863. *Autopsy* the same day: Body very much emaciated; skin ecchymosed on the trunk and extremities. Heart, lungs, liver, spleen, pancreas, stomach, and kidneys healthy. Mucous membrane of the ileum slightly inflamed; the agminated and solitary glands white and slightly enlarged. Mucous membrane of the colon intensely inflamed throughout, softened, and everywhere covered with a thin broken layer of white pseudomembrane, adherent tightly, and composed of pyoid corpuscles; there were also a multitude of ecchymosed spots not larger than flea-bites; the solitary glands were inconspicuous, and appeared not to be diseased.—Acting Assistant Surgeon Joseph Leidy.

CASE 170.—Corporal Charles Gerberding, company F, 52d New York volunteers; admitted from Alexandria, Virginia, December 13, 1862. Diarrhœa and tonsillitis. [The records of the 2d division hospital, Alexandria, Virginia, show that this man was admitted November 6, 1862—diagnosis acute diarrhœa—and transferred to another hospital December 12th.] Died January 11, 1863, at 10 P. M. *Autopsy* next day: Apparent age about 45; body greatly emaciated. The fauces and part of the pharynx exhibited rather thick white patches of pseudomembranous matter without ulceration, (diphtheria?) Lungs and heart healthy. Liver red-ochre colored, not enlarged, but somewhat fatty. Spleen small, but apparently healthy. Stomach, pancreas, and kidneys without apparent disease. Mucous membrane of the ileum paler than usual, except that there were a few small patches of moderate inflammation; the solitary and agminated glands contained black deposit, but otherwise appeared natural. The large intestine presented seven patches of inflammation about the size of the hand, nearly equidistant, the first in the cæcum, the last at the sigmoid flexure of the colon; there were also small ecchymosed spots, and the solitary glands contained black matter, but there were no ulcerations in any part of the intestinal canal. The case appeared as if it had been one of convalescing Chickahominy diarrhœa, in which the patient died of exhaustion before the cure had been carried out. The blood presented an impoverished condition as relates to the quantity of blood corpuscles, though there appeared to be no change of relation between the number of red and white corpuscles.—Acting Assistant Surgeon Joseph Leidy.

CASE 171.—Private Dennis O'Keef, company F, 6th Maine volunteers; age 45; admitted from Washington, D. C., December 18, 1862. Intermittent fever. [The register of the Odd Fellows' Hall hospital, near the Navy Yard, Washington, shows that this man was admitted to that hospital November 17th, and transferred to another hospital December 17th; no diagnosis.] Died, January 22, 1863. *Autopsy* the same day: Body exceedingly emaciated; skin tinged with bile. Heart and pericardial liquor tinged with bile; the right auricle and ventricle each with a white opaque membranous patch the size of a quarter dollar. Lungs with old adhesions throughout, but otherwise healthy. Liver enormous, extending down the front of the abdomen so as to cover half the remaining contents; its surface was dull-brown, and coarsely nodulated; the right lobe contained a large multilocular abscess, filled with a pint or more of thick greenish-yellow pus; the left lobe contained a smaller abscess of the same kind; gall-bladder very small, filled with bile resembling coal-tar in color and consistence. Peritonitis. The small and large intestines covered with thin recent pseudomembranous matter. The stomach empty, apparently healthy. Pancreas dense. Spleen small but healthy. Ileum with the mucous membrane moderately inflamed and blackened. Colon exceedingly contracted; in the middle of its course not more than three-quarters of an inch in diameter, and all appearance of sacculi obliterated; its mucous membrane greenish-black, with streaks of inflammation and a few ecchymosed spots. All the intestines were empty, except a small quantity of brownish tenacious mucus, which was exceedingly fetid, adhering to the sides.—Acting Assistant Surgeon Joseph Leidy. [No. 333, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the right lobe of the liver, in which there are a number of irregular communicating abscess cavities, the largest four inches in long diameter.]

CASE 172.—Private James Litzenberg, company A, 26th Pennsylvania volunteers; age 40; German; admitted from Washington, D. C., December 12, 1862. Diarrhœa. [The register of Carver hospital, Washington, shows that this man was admitted to that hospital November 20, 1862—diagnosis rheumatism—and transferred to another hospital December 11th.] Died, January 22, 1863. *Autopsy* the same day: The body looked as if the patient had been, before his illness, of great vigor and muscular strength, but was now emaciated. Brain healthy. Right lung with old adhesions to the costal pleura; the apex with a tubercle the size of a marrow-fat pea, and several small ulcerated cavities; left lung with a few tubercles about the size of pepper grains in its apex and scattered at the back part of the upper lobe. Pericardium with about a teacupful of liquor. Heart flabby, with a large white clot in the right ventricle. Spleen flabby, reddened, and roughened on the surface, (apparently the evidences of an old inflammation;) structure very soft purplish red. Solitary and agminated glands of the ileum slightly enlarged, and opaque white. Colon with the mucous membrane soft, grayish, with a few red streaks of inflammation and a few ecchymosed spots. Remaining organs apparently healthy.—Acting Assistant Surgeon Joseph Leidy. [Nos. 81 and 85, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the ileum, showing pin-head enlargement of the solitary follicles and slight thickening of Peyer's patches.]

CASE 173.—Private William Powers, company D, 1st United States chasseurs; admitted from Fairfax Seminary hospital, Virginia, December 16, 1862. Phthisis and diarrhœa. Remarks by Acting Assistant Surgeon H. West: This man was transferred to this hospital December 16, 1862, from an Alexandria hospital. The diagnosis then made was phthisis. There was no dulness on percussion, but the respiration was at times cavernous, and at times much obstructed. I was not able to make as careful an examination as I should have liked, owing to the vermin which, in his condition, it was impossible entirely to destroy. During the whole time he was under my care the treatment was palliative and strengthening, viz: Cod-liver oil and iron, stimulants and morphia, chalk-mixture and laudanum, with astringents, were used to check the exhausting diarrhœa. [The register of the Fairfax Seminary hospital shows that this man was admitted to that hospital December 7, 1862—diagnosis chronic diarrhœa—and transferred to Philadelphia December 15th.] Died, February 1, 1863. *Autopsy:* Body extremely emaciated. About a gill of liquid in the pericardium. Heart somewhat enlarged, due to dilatation of the right ventricle, the walls of which were about two lines thick, and the cavity contained a large and recent white fibrinous clot. The right lung was healthy, and without old adhesions; the left lung for the most part was healthy, except that the inferior anterior angle was affected with pleuro-pneumonia, forming an indurated mass the size of an egg, adhering by recent pseudomembrane to the neighboring reflected pleura; the base of the lower lobe was affected with recent pleurisy, as indicated by engorgement of the subserous capillaries and a band of pure white pseudomembrane about two lines wide fringing the lower acute margin of the lung; inflammation of the tracheal and bronchial mucous membrane. Liver nearly uniformly brown on the surface and on section; gall-bladder entirely empty. Spleen small, indurated, and attached throughout by old adhesions. Kidneys healthy. Stomach and small intestines distended with air; the lower fifteen inches of the ileum affected with pseudomembranous inflammation; the agminated glands containing black deposits. The colon contracted; its mucous membrane exceedingly corrugated, inflamed, generally of a slate color, with darker patches and spots of the same, and pseudomembranous matter adherent from one end to

the other; the pseudomembranous matter adhered tightly, was fibro-granular in structure, and replaced the columnar epithelium, which appeared normal in the intervals of the pseudomembranous shreds; the dark patches of coloring matter were produced by the deposit of black globules about half the size of blood disks and smaller.—Acting Assistant Surgeon Joseph Leidy. [Nos. 55 to 59, Medical Section, Army Medical Museum, are from this case. No. 55 is the spleen, with numerous peritoneal adhesions. No. 56 is a portion of the ascending colon, with small patches of pseudomembrane adherent to the mucous surface, and ulceration of some of the solitary glands. No. 57, from further along the colon, presents more numerous and better marked follicular ulcers. No. 58, from the transverse colon, presents fewer ulcerated follicles, but the small pseudomembranous patches are more numerous. No. 59, from the descending colon, exhibits still larger pseudomembranous patches and still fewer ulcers. The coats of the colon are thickened in all these pieces, and many of the solitary follicles, instead of ulcerating, have been converted into cysts, the largest of which are about the size of peas. This condition is most noteworthy in No. 57.]

CASE 174.—Private Joseph Kessinger, company C, 5th Wisconsin volunteers; admitted from Fairfax Seminary hospital, Alexandria, Virginia, December 16th. Chronic diarrhœa. Treatment: Cough mixture, pills of opium, ipecacuanha, and acetate of lead, milk-punch, beef-essence, extra diet. [The register of Fairfax Seminary hospital shows that this man was admitted to that hospital December 13, 1862—diagnosis chronic diarrhœa—and transferred to Philadelphia December 15th.] Died, February 6, 1863. *Autopsy* same day: Age about 35 years; emaciation extreme. Heart and lungs healthy. Liver pale red; gall-bladder empty. Spleen Indian-red on section. Stomach and pancreas healthy. The ileum inflamed, more especially at its lower extremity; the lower agminated and solitary glands intensely reddened, and the lowest four of the former ulcerated through at their centres to the muscular coat of the intestine; the middle agminated glands containing black deposits, the upper ones healthy. Colon much contracted; its mucous membrane exceedingly corrugated and considerably inflamed, especially within the cæcum.—Acting Assistant Surgeon Joseph Leidy.

CASE 175.—Private Alfred E. French, company K, 5th Vermont volunteers; age 21; admitted from Harrison's Landing, Virginia, August 10, 1862. Chronic diarrhœa, contracted while on the Chickahominy. Note by Acting Assistant Surgeon L. K. Baldwin: This patient came under my charge October 1, 1862. His diarrhœa was not at any time excessive, but he was very weak. There was considerable gastric irritation and dyspepsia, which yielded in a great measure to the use of subnitrate of bismuth and low diet. He gained sufficiently to be able to move about, and was made to walk out whenever the weather would permit. He seemed to improve until about two weeks before his death, when he began to complain of a severe pain in the right side, with symptoms resembling pneumonia. Toward the last the stomach was so irritable that but little food was retained. There was not much diarrhœa during the last two weeks of his life. Died, February 18, 1863, at 8 A. M. *Autopsy* same day: Body emaciated; skin sallow. Brain large, unusually pale; vessels of the pia mater for the most part empty; subarachnoid space distended with serous liquid containing some pus; at the base of the brain, in several portions of the same space there were small accumulations of pus, especially in the fourth ventricle, which contained about four or five minims of pure pus; arachnoid everywhere dull whitish; in many places, especially along the course of the larger vessels, and at the edges of the great longitudinal fissure, with a subjacent, adherent, soft, yellowish, fibrinoid matter. (Evidently the anatomical characters of meningitis, though its existence was not suspected during life.) On the convex surface of the left cerebral hemisphere there were three small ecchymosed spots; interior of the brain apparently healthy. Left lung with old adhesions to the costal pleura, but the tissue healthy; right lung with slight old adhesions at the back part of the upper lobe, which was in an early stage of pneumonic induration; the middle and lower lobes healthy. Heart healthy. Stomach containing a considerable quantity of clear glairy liquid mingled with bile, which deeply stained the mucous membrane. Liver large, brown in color, apparently healthy. Spleen consistent, reddish-brown on section. Ileum with slight inflammatory streaks here and there, and with a small patch of moderate inflammation near the lower end; the glands were healthy, except that the lowest agminated glands contained black matter. Slight inflammation of the cæcum, and rather more redness than natural in most parts of the colon, the solitary glands of which contained black matter. Kidneys partly congested and partly pale; the pale portions presented many of the cells with more fat than natural. Supra-renal bodies healthy.—Acting Assistant Surgeon Joseph Leidy.

CASE 176.—Private Peter Quinn, company H, 63d Pennsylvania volunteers; admitted July 7, 1863, for contusion of the foot received at Gettysburg, Pennsylvania. The ball or shell had struck on the dorsum of the foot, and produced much pain and inflammation. He was unable to bear any weight on the ankle. A cold-water dressing was applied, and the patient so far recovered that on the 19th he was able to walk without the aid of cane or crutches. On this date diarrhœa commenced, and was treated successfully; whereupon he obtained a pass for one day, but was absent four. By questioning him closely, I learned that he had been on a debauch, and had been in the guard-house. The foot was now swollen and the diarrhœa tending to dysentery. He complained but little of pain, but much of debility. The age of the patient (sixty-three years) was considered, but his debility attributed to his recent spree. Pills of two grains of quinine and half a grain of opium were ordered every three hours, half an ounce of brandy every two hours, and a laudanum enema. The stools, however, grew more bloody and frequent during the day; counter-irritants were applied to his abdomen. On the evening of August 4th he was delirious, and walked about the ward. On the morning of the 5th he was found sinking rapidly, and stimulants were given more freely; at 10 A. M. he attempted to get out of bed to stool, but fainted, after which he was unable to speak distinctly, and died at 11.30 A. M. *Autopsy* same day: Body emaciated. Extensive old pleuritic adhesions on both sides. Parenchyma of lungs healthy. Old adhesions about the spleen. Pseudomembranous inflammation of the entire large intestine. Other organs healthy.

CASE 177.—Private Robert Bedell, company H, 74th New York volunteers; age 45; admitted June 25, 1863, from Harewood hospital, Washington, D. C. Chronic diarrhœa. [The records of the regimental hospital of the 74th New York show that this man was admitted to that hospital, then at Camp Kearney, near Alexandria, Virginia, October 29, 1862, for diarrhœa, and returned to duty October 30th. He was again admitted to regimental hospital, then at Camp Sickles, near Manassas, Virginia, November 4th, with the same disease, and returned to duty November 5th. He was admitted a third time to regimental hospital, then near Warrenton Junction, Virginia, November 12th; the diagnosis recorded is dysentery. He was returned to duty November 18th. He was admitted a fourth time to regimental hospital, then near Fredericksburg, Virginia,

February 8, 1863—dysentery—and returned to duty February 9th; the regimental hospital still remaining near Fredericksburg, he was treated for the fifth time, from February 12th to February 14th, and a sixth time, from March 5th to April 19th, the diagnosis now being diarrhœa. April 19th he was transferred to general hospital. He next appears on the register of the Harewood hospital, Washington, D. C., where he was admitted June 14th, for chronic diarrhœa, and transferred to Philadelphia June 24th.] Died, September 22d. *Autopsy:* Body well nourished; suggillation posteriorly. There were a few old adhesions of the right lung to the pleura and diaphragm; the left fifth rib was bifurcated. Large clots were found in both sides of the heart, especially in the right; the pericardium contained half an ounce of fluid. The liver and gall-bladder were healthy. The spleen was small. The stomach inflamed throughout, especially near its cardiac orifice. The ileum was congested on the peritoneal surface, internally inflamed throughout; Peyer's patches were not thickened. The colon was inflamed and thickened.—Acting Assistant Surgeon E. A. Smith.

CASE 178.—Private Henry C. Durham, company G, 30th United States colored troops; age 29; admitted from City Point, Virginia, August 20, 1864. Chronic diarrhœa of two months' duration. [The register of the hospital for colored troops, City Point, Virginia, shows that this man was admitted August 14, 1864—no diagnosis—and transferred to another hospital August 17th.] The patient stated that he had been subject to pains in the breast and occasional colds for several years. He was much emaciated and debilitated, complained of a dull pain in the epigastrium, and vomited nearly all his meals. His breath was very fetid. A diarrhœa mixture was prescribed, and compound tincture of cinchona to be taken before meals. September 2d: The gastric symptoms still continue; bowels very loose. The vomiting was temporarily checked by lime-water and milk, but soon recurred; creasote was therefore tried in half-drop doses four times daily; this, however, seemed to increase the pain, and put no stop to the fetor of breath. September 6th: Grows steadily worse. To take twelve grains of subcarbonate of bismuth four times a day. September 7th: Is able to eat a little; the fetor of the breath is increasing; the stools are purulent. September 9th: Stop the subcarbonate of bismuth, and give twenty drops of oil of turpentine four times a day. Died, September 10th. *Autopsy:* The lungs presented nothing abnormal except that the left lung was everywhere adherent to the thoracic parietes. The heart was small. The liver was healthy. The spleen was exceedingly small. The stomach and the large intestine were congested, and the rectum extensively ulcerated.

CASE 179.—Private William Otis, company I, 153d New York volunteers; age 45; admitted from camp October 30, 1864. Chronic diarrhœa. [The register of the field hospital, Sandy Hook, Maryland, shows that this man was admitted to that hospital September 9th—no diagnosis—and transferred to another hospital September 10th. The register of the 1st division of the Annapolis hospital, Maryland, shows that he was admitted to that hospital September 10th, and transferred to the hospital at Camp Parole, Annapolis, Maryland, October 8th. The register of Camp Parole hospital shows that he was admitted October 8th—dropsy—and transferred to Baltimore October 12th. The register of Patterson Park hospital, Baltimore, shows that he was admitted to that hospital October 13th—convalescent—and transferred to Newton University hospital October 17th. The register of Newton University hospital shows that he was admitted to that hospital October 18th—gastritis—and transferred to Philadelphia October 23d.] When admitted to this hospital he had thin, frequent stools; was much exhausted and feverish. Ordered pills of acetate of lead, opium, and camphor during the day; two grains of blue mass at night. November 4th: Complains of pain in the chest; there is, however, no cough and no abnormal expectoration. The stools are less frequent, but he has a good deal of hiccough; the latter symptom, however, was relieved by carminatives. November 6th: Has constant nausea and vomiting. Stop medicine and give lime-water and milk. November 8th: The nausea yielded after a few doses of lime-water and milk. This morning, the bowels not having been moved for over twenty-four hours, an injection was given, which produced a dark, thin discharge. The patient seemed very feeble, and sank rapidly in spite of the free administration of stimulants. He died at 7.30 P. M. *Autopsy* thirty-six hours after death: The brain was healthy. The lungs were much congested. There was a large coagulum of fibrin in the right side of the heart; the right ventricle was dilated; the left auricle contained a large clot of soft, black blood. The liver was somewhat fatty. The spleen and kidneys were healthy. The lower part of the ileum and the colon were inflamed.

CASE 180.—Private William M. Henderson, company G, 187th Pennsylvania volunteers; age 37; admitted November 12, 1864, from furlough. Chronic pleurisy. This man stated that he was taken sick with diarrhœa July 3d, while with his regiment at Petersburg, Virginia, and was sent to division hospital. He remained there about a week, and was sent to City Point July 11th. He was then dropsical. August 1st he was transferred to David's Island, New York harbor; he still had symptoms of dropsy. August 9th he was furloughed for thirty days, and ordered to report, on returning from furlough, to the medical director at Philadelphia. When his furlough expired he was too sick to report, and his attending physician obtained an extension of his furlough for thirty days. At the expiration of this time he was still too sick to report, and got thirty days more. November 11th he reported to the medical director in Philadelphia, and was sent to this hospital. [The register of the field hospital of the 1st Division, 5th Army Corps, shows that this man was admitted to that hospital July 4, 1864—anasarca—and sent to City Point, Virginia, July 11th. The register of the depot hospital of the 5th Army Corps, City Point, Virginia, shows that he was admitted to that hospital July 11th—Bright's disease—and sent to New York harbor. The register of the De Camp hospital, David's Island, New York harbor, shows that he was admitted to that hospital August 6th—dropsy—and furloughed August 9th, with orders to report in Philadelphia on the expiration of his furlough.] He died November 21st. *Autopsy* the same day: The lower extremities were somewhat œdematous. The membranes of the brain were congested, and there was a good deal of effusion in both lateral ventricles; the substance of the brain was softened and somewhat congested. There were slight pleuritic adhesions on the right side; the right lung had four lobes, and was very pale. There were strong pleuritic adhesions on the left side, and the left lung was bright red. The bronchial tubes were inflamed and full of pus. The left ventricle of the heart was dilated and somewhat hypertrophied; the valves were healthy; both ventricles contained coagula of black blood; the right auricle contained a fibrinous coagulum. The liver was enlarged and fatty; the gall-bladder distended with black bile. The spleen, kidneys, stomach, and small intestine were healthy. [The condition of the large intestine is not recorded.]

Case 181.—Private Anton Stadler, company D, 12th Maine volunteers; age 55; admitted from field hospital October 25, 1861. Chronic diarrhœa. This man left his regiment October 19th. He stated that he had suffered from diarrhœa for a month previously. To take quarter of a grain of opium and two grains of tannic acid every three hours. Full diet. November 5th: He had a chill, followed by fever. To take two grains of sulphate of quinine every two hours. November 7th: There has been no recurrence of the chill. To take ten drops of tincture of the chloride of iron and a grain of quinine three times daily. January 27, 1865: The patient is improving. Furloughed twenty days. February 9th: Returned from furlough at 8 o'clock this evening; was carried in on a stretcher. Has pneumonia, and is very much prostrated. Ordered carbonate of ammonia, milk-punch, beef-tea, &c. Died, February 10th. *Autopsy* thirty-six hours after death: The right lung was bound firmly to the walls of the chest throughout; there were no adhesions on the left side; the apex of the right lung contained a large mass of tubercle; the whole of the right lung, from apex to base, was solidified; the inflammation in the upper and middle lobes had passed into the third stage; the lower lobe was still in the second stage; a few tubercles were found in the apex of the left lung; in other respects the left lung was healthy. [The condition of the intestinal mucous membrane is not recorded.]

The next three cases are from the case-book of the Cuyler Hospital, Philadelphia, Pennsylvania, Surgeon Josiah Curtis, U. S. V., in charge at the date of the first case; Assistant Surgeon Henry S. Schell, U. S. A., at the time the others were recorded:

Case 182.—Corporal William H. Everett, company C, 5th Maine volunteers; age 29; admitted May 13, 1863. Chronic diarrhœa. [He appears on the register of the regimental hospital of the 5th Maine, admitted March 20, 1863—chronic diarrhœa—sent to general hospital April 18th. The register of the hospital of the 1st Division, 6th Army Corps, records him admitted April 18th—chronic diarrhœa—sent to Washington, D. C., April 21st. He is borne on the register of the Harewood hospital, Washington, admitted April 21st—chronic diarrhœa—sent to Philadelphia May 9th.] This man stated that he was taken sick with diarrhœa in January last. He was treated in the Broad and Prime streets hospital for several days, and his diarrhœa was temporarily checked. He was brought to this hospital on a stretcher. When admitted he was much emaciated; his voice was very feeble; pulse small and feeble; eyes sunken; the temperature of his surface low. Treatment: Acetate of lead and opium, quinia, brandy, &c. Died, May 14th. *Autopsy* eleven hours after death: Brain not examined. There were no pleuritic adhesions; the left lung was somewhat congested; the right lung contained an unusual quantity of black pigment, and had a white cheesy mass in the upper part of its middle lobe. The heart was normal in size and appearance; its right cavities contained a fibrinous clot. The liver was somewhat congested, but normal in size and appearance; the gall-bladder was distended with normal looking bile. Some of Peyer's patches were quite large, but none of them were ulcerated. [The condition of the large intestine was not recorded.]—Acting Assistant Surgeon William Darrach, jr.

Case 183.—Private William Whitmore, company C, 90th Pennsylvania volunteers; age 38; admitted October 2, 1863. Diarrhœa. [The records of the regimental hospital of the 90th Pennsylvania, then serving with the army of the Potomac, show this man admitted September 1, 1863—rheumatism—sent to general hospital September 16th. He is borne on the register of the Columbian hospital, Washington, D. C., admitted September 16th—contusion—transferred to Philadelphia October 1st.] This patient stated that he had suffered more or less from diarrhœa since the spring of 1862. He was under the charge of Acting Assistant Surgeon Dunton for about eight months in this hospital, and improved somewhat in general health, having been exceedingly debilitated and emaciated when admitted. When first seen by the reporter, in June, 1864, he had every day three or four watery stools unaccompanied by pain, and was still weak, with excessive thirst and deficient appetite. The treatment adopted was tonic, astringent, and nutritive, and he seemed gradually to improve, the number of stools being reduced to two daily. On the evening of August 2d he returned from a pass very much intoxicated, and in the course of the night was attacked with acute abdominal pain, with coldness of the extremities, and died next day. *Autopsy:* The brain was not examined. The lungs and heart were healthy. The liver was somewhat softened; the gall-bladder distended with bile. The spleen was small and shrivelled. The stomach and intestines were much congested. The ascending and transverse colon presented numerous ulcerations.—Acting Assistant Surgeon P. D. Keyser.

Case 184.—Wagoner George A. Gleek, company I, 1st Michigan cavalry; age 37; admitted August 30, 1864. Chronic diarrhœa of three months' standing. [The register of the post hospital of the cavalry division, Camp Stoneman, D. C., shows that this man was admitted to that hospital August 2, 1864, with diarrhœa, and sent to Lincoln hospital August 11th. He appears on the register of Lincoln hospital, Washington, D. C., admitted August 12th—incontinence of urine—sent to Philadelphia August 29th.] He was much emaciated, and his skin had a peculiar tan color. He had no appetite, was much debilitated, and kept his bed the greater part of the time. He had frequent stools and considerable abdominal pain. The treatment adopted was tonic, astringent, and anodyne, with nutritious food, and stimulus graduated according to his condition. He slowly sank, and died October 24th. *Autopsy* next day: Rigor mortis well marked; body greatly emaciated. The brain was not examined. There were extensive pleuritic adhesions, both old and recent, on the left side; both lungs contained abundant pigment deposits. The heart and pericardium were healthy. The omentum almost entirely devoid of fat. The stomach was slightly congested. The spleen enlarged. The small intestines presented numerous ulcers in the neighborhood of the ileo-cæcal valve. The remaining viscera appeared to be normal.

The following case was forwarded on a medical descriptive list from the McClellan Hospital, Philadelphia, Pennsylvania, Surgeon Lewis Taylor, U. S. A., in charge:

Case 185.—Private Casper Shoenberger, company G, 61st Pennsylvania volunteers; age 27; admitted from Sandy Hook, Maryland, September 27, 1864. Bright's disease of the kidneys. [The register of the field hospital, Sandy Hook, Maryland, reports this man admitted September 25, 1864—dropsy—sent to general hospital September 26th.] The urine was albuminous,

and there was general anasarca. The disease pursued its usual course until October 4th, when he had three convulsions of short duration. Next day he was attacked with dysentery of a severe character, and died October 9th. *Autopsy* twenty-four hours after death: The colon and rectum were found to be greatly inflamed and thickened. The kidneys were fatty. There were also two retrograde intussusceptions, eight inches apart, in the upper third of the ileum.—Acting Assistant Surgeon J. Orso Day.

The next two cases are from the case-book of the MOWER HOSPITAL, Philadelphia, Pennsylvania, Surgeon Joseph Hopkinson, U. S. V., in charge at the date of the first case; Surgeon Lewis Taylor, U. S. A., at the date of the second:

CASE 186.—Sergeant Michael Halloran, company F, 14th New York artillery; age 19; admitted from City Point, Virginia, July 26, 1864. Chronic diarrhœa. [This man is borne on the register of the hospital of the 1st Division, 9th Army Corps, City Point, Virginia, as admitted from regimental hospital July 14, 1864—diarrhœa and fever—sent to general hospital July 23d.] When brought in, the patient was much emaciated and prostrated. He had diarrhœa and obstinate vomiting; the matter vomited had a bilious character; the stools were greenish-yellow, watery, and accompanied by pain. Ordered small doses of calomel and morphia; also emulsion of turpentine; milk-punch and beef-essence. July 27th: No change; the vomiting is persistent. Applied a mustard plaster to the abdomen. July 28th: Vomits less; diarrhœa about the same. To use stimulants freely. Died, August 3d. *Autopsy*: The mucous membrane of both the large and the small intestines was inflamed and ulcerated. There was intense congestion of the portal circulation, and the liver was enlarged.

CASE 187.—Private Peter Woodley, company D, 115th United States colored troops; age 25; admitted July 31, 1865. Chronic diarrhœa and scurvy. [This man appears on the records of the hospital at Whitehall, Pennsylvania, admitted May 20, 1865—convalescent—sent to general hospital June 26th. He is borne on the register of the Satterlee hospital, Philadelphia, admitted June 26th—chronic diarrhœa—sent to Mower hospital July 31st.] This man had symptoms which suggested consumption. He was treated with cod-liver oil, tincture of cinchona, and whiskey. Died, August 20th. *Autopsy* six hours after death: The right pleural sac was partially filled with fluid blood. The right lung was much congested; the left lung slightly congested; no tubercles were found in either lung. The pericardium was firmly adherent to the left ventricle of the heart; the auricles and valves of the heart were normal; the right ventricle was distended with fluid blood; the left ventricle contained a small clot. Everywhere else the blood was fluid. The liver was paler than normal, but not otherwise diseased, and the other abdominal viscera were apparently healthy. The abdominal cavity contained a considerable quantity of serum. The source of the hæmorrhage into the right pleural cavity was not satisfactorily made out.

The next three cases are from the case-book of the SUMMIT HOUSE HOSPITAL, Philadelphia, Pennsylvania, Surgeon J. H. Taylor, U. S. V., in charge:

CASE 188.—Private Reuben Peters, company B, 43d United States colored troops; age 21; admitted from Satterlee hospital, Philadelphia, September 29, 1864. Debility and diarrhœa. [This man is borne on the register of Satterlee hospital as admitted August 20, 1864—consumption.] September 30th: ℞. Tincture of catechu, paregoric, and tincture of ginger, of each half an ounce, tannic acid a drachm and a half. Take a teaspoonful every two or three hours; also a teaspoonful of tincture of cinchona four times a day. Full diet. October 4th: Very much improved. October 5th: No treatment. The patient remained in hospital comparatively well until November 23d, when he complained of a cough, for which an expectorant mixture was prescribed. In a few days the cough began to diminish, and December 3d he was put on duty as an attendant in the ward. December 6th: The diarrhœa has returned with considerable violence. Prescribed nitrate of silver and opium. Full diet. December 8th: To take ten drops of the tincture of the chloride of iron three times a day; four ounces of brandy daily. December 9th: His bowels were moved six to eight times yesterday; he is much debilitated. December 15th: Is improving; diarrhœa stopped; general condition good. December 19th: Complains of headache; pulse full, 90 to 95; tongue coated, but moist; skin dry. ℞. Tartar emetic one grain, ipecacuanha thirty grains; make two powders; the second to be given if the first does not produce emesis. December 21st: The diarrhœa is again troublesome. To take pills containing nitrate of silver. December 23d: The patient has all the symptoms of typhoid fever. December 24th: Prescribed quinine in solution. December 25th: A purge of calomel and rhubarb; symptoms of pneumonia have made their appearance, affecting the left lung more than the right; pulse 85 to 90, not very full; great prostration; tongue and lips dry; the patient is insensible. Quinine solution renewed; turpentine emulsion. December 27th: A blister applied to the chest. December 29th: No better. Carbonate of ammonia. December 31st: A pustule has made its appearance over the pupil of the right eye. Died, January 1, 1865. *Autopsy:* The mucous membrance of the bronchial tubes was inflamed; the lungs were extensively hepatized; the right lung adherent to the thoracic parietes. The heart was healthy; its right ventricle filled with blood. The liver was enlarged. [The condition of the alimentary canal is not recorded.]

CASE 189.—Private Frank Diggs, company I, 4th United States colored troops; age 20; admitted from Hampton hospital, Virginia, August 17, 1864. Chronic diarrhœa. [This man appears on the register of Hampton hospital, Fortress Monroe, Virginia, as admitted June 11, 1864, from the field—intermittent fever—transferred to Philadelphia August 15th.] He was treated at first with pills of acetate of lead and opium. Full diet. Under this treatment he improved until September 7th, when intermittent fever made its appearance, and was successfully combated by quinine. October 7th: Rheumatic symptoms were developed, and were treated with a combination of sulphate of cinchona and iodide of iron. Toward the close of the month he had a mild attack of tonsillitis, which, however, speedily subsided, and by November 5th he was able to do duty as a nurse. Toward the end of November the lymphatic glands of his neck began to enlarge, and were painted with tincture of iodine. The tonsils also again enlarged, and an abscess formed in the left tonsil, which discharged December 9th. Shortly after a severe bronchitis was

developed, and December 21st slight febrile symptoms made their appearance. December 22d: The symptoms have increased and have assumed a typhoid character; the patient was very restless last night, tongue moist but furred, pulse between 80 and 90, bowels open, fæces natural. A solution containing chlorate of potassa and sulphate of cinchona was prescribed, with cold applications to the forehead, and brandy. December 24th: The symptoms are those of fully developed typhoid fever: skin dry, tongue moist; the patient is greatly debilitated, very restless, and has a good deal of cough. Prescribed an emulsion of oil of turpentine combined with syrup of squill. December 30th: Erysipelas of the face has made its appearance. Continue treatment, with the addition of quinine. January 15, 1865: The patient is now fairly convalescent, but has considerable swelling of the tonsils, more marked on the left side. He was treated with tincture of gentian and quinine. January 22d: An incision was made into the left tonsil and a great deal of pus discharged. February 2d: Typhoid pneumonia set in, involving the left lung. Quinine was prescribed, and a mixture containing seneka, squill, and laudanum. February 4th: Substitute a mixture containing nitrate of potash and veratrum viride. February 7th: He is improving, but still feverish; the left tonsil is still discharging. R. Calomel sixteen grains, chlorate of potassa half a drachm, opium a grain and a half; make eight powders. Take one every hour; six ounces of brandy daily. February 13th: The fever has entirely subsided, and the patient seems to be making good progress toward recovery. February 22d: Stimulants stopped. March 2d: The diarrhœa has recurred. To take pills of acetate of lead and opium. March 7th: The diarrhœa continues; there is much debility; the tonsils are still discharging. To take fifteen drops of tincture of chloride of iron three times a day. March 11th: Renew the lead and opium pills, one to be taken after every stool. March 17th: Again has a severe cough and great debility. March 22d: Applied a blister to the breast, and gave a cough mixture containing squill and morphia. March 23d: Is greatly prostrated; expectorates daily almost a quart of bloody pus; pulse feeble and remittent; his respiration appears to be effected by the left lung only; no respiratory murmur is heard on the right side. Died, March 25th, of suffocation, after a short struggle. *Autopsy* thirty-six hours after death: The right lung contained a great number of tubercles, and two large cavities filled with pus were found in its upper lobe; in the upper lobe of the left lung also a great many miliary tubercles were found; the lower lobe was healthy. The mucous membrane of the intestine was ulcerated.—Acting Assistant Surgeon G. O. Shittler.

CASE 190.—Private James O'Keefe, company D, 65th New York volunteers; age 47; admitted from Jarvis hospital, Baltimore, Maryland, April 3, 1865. Fistula in ano and diarrhœa. [This man appears on the register of the depot field hospital, 6th Army Corps, City Point, Virginia, as admitted December 5, 1864, for a boil, and sent to general hospital December 25th. He appears on the register of the Jarvis hospital, Baltimore, Maryland, as admitted December 26th—fistula in ano. While in Jarvis hospital it appears, from the register of surgical operations, that the fistula was slit open January 30, 1865.] When admitted to this hospital the wound had not yet healed. The patient also has a troublesome cough, which set in after the operation. Prescribed an expectorant mixture, and applied a simple dressing to the wound. April 10th: Rubbed the chest with croton oil. Extra diet. April 18th: The cough continues and the patient is much debilitated; he has a troublesome diarrhœa. Ordered a pint of brandy daily. May 22d: The diarrhœa is better, the cough continues, the sputa are tenacious, frothy, and mixed with pus. May 24th: Is very weak; coughs incessantly; has great dyspnœa; pulse 112; the diarrhœa continues. Died, May 26th, at 5 P. M. A few minutes before death he asked for brandy, sat up to take it, and expired suddenly. *Autopsy* seventeen hours after death: Rigor mortis marked. Both lungs were filled with softened tubercles. The heart was small; its left ventricle contained some thin black blood. The liver, spleen, and kidneys were healthy. [The condition of the intestines is not recorded.]

The following case was forwarded, with the specimens, from the hospital at the corner of FIFTH AND BUTTONWOOD streets, Philadelphia, Acting Assistant Surgeon Aug. C. Bournonville, in charge.

CASE 191.—Private Peter Brandey, company D, 62d New York volunteers; admitted August 12, 1862. Intermittent fever and diarrhœa. Died, August 26th.—Acting Assistant Surgeon E. Hartshorne. [Nos. 148 and 149, Medical Section, Army Medical Museum, are from this case. The specimens are two successive portions of colon, the surface of which has been extensively eroded by ulceration, leaving, however, numerous little islets of intact mucous membrane, in many of which pinhead ulcers of the solitary follicles can be seen.]

The following case was forwarded, with the specimens, from the CHRISTIAN STREET HOSPITAL, Philadelphia, Surgeon John J. Reese, U. S. V., in charge:

CASE 192.—Private Joseph R. Reid, company H, 82d New York volunteers; admitted from Washington, D. C., December 14, 1862. Chronic diarrhœa and phthisis. [This man appears on the register of the Casparis hospital, Washington, as admitted December 2d—diarrhœa—sent to Philadelphia December 13th.] Died, December 31, 1862.—Acting Assistant Surgeon E. B. Vandyke. [Nos. 317 to 320, Medical Section, Army Medical Museum, are from this case. Nos. 317, 318, and 319 are successive portions of the ileum, presenting large irregular ulcers of Peyer's glands, which penetrate to the muscular coat. No. 320 is a portion of the colon considerably thickened, and presenting a number of large irregular ulcers, which penetrate to the muscular coat; a number of enlarged lymphatic glands appear on the peritoneal surface of the piece, on the line of the attachment of the mesocolon.]

The next seven cases are from the NATIONAL HOSPITAL, Baltimore, Maryland, Assistant Surgeon George M. McGill, U. S. A., surgeon in charge. The notes of sixty-one *post mortem* examinations, made by Dr. McGill while in charge of this hospital, were

printed by him on a hand-press in the hospital, and forwarded to the Surgeon General's Office.* From these notes the following abstracts have been made, which include all the autopsies reported by Dr. McGill from the National Hospital on cases of diarrhœa or dysentery:

CASE 193.—Private C. B. Kittle, 10th Wisconsin battery; age 32; admitted from the medical director's office January 10, 1865. Diarrhœa, with extremely irritable stomach and pain in the right iliac fossa. About the third day after admission low fever set in, with muttering delirium at night, and slight cough. Some fine crepitation was heard over the lower portion of the right lung. Died, January 16th.—Acting Assistant Surgeon J. G. Keller. *Autopsy:* Body emaciated; right side of chest, anteriorly, larger than the left. The brain was normal. There was red hepatization of the posterior third of the upper lobe of the right lung, the whole of its lower lobe, and the central portion of the lower lobe of the left lung; on pressure, the hepatized portions yielded an abundance of grayish puruloid fluid. Inflammatory spots and ulcers were observed in the lower portion of the ileum, and in the large intestine. One of the ulcers in the cæcum had perforated, and communicated with a small abscess containing about two ounces of dark-colored, offensive, caseous, puruloid matter, which burrowed between the iliacus internus and psoas magnus muscles; extravasation into the abdominal cavity had been prevented by adhesions of the cæcum and ascending colon to the abdominal parietes. The liver was congested, and about one-fourth larger than natural. The spleen was a little hard, of natural size; the lower part of its anterior border congested and black. The kidneys were pale, except in their inferior portions, which were congested and cherry-colored.—Assistant Surgeon George M. McGill, U. S. A. [No. 618, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the cæcum, with the ileo-cæcal valve and two inches of the ileum. There were several ulcers in the cæcum, one of which had perforated.]

CASE 194.—Private John Kreul, company K, 199th Pennsylvania volunteers; age 20; admitted December 2, 1864. Chronic diarrhœa. This patient had typhoid symptoms and partial coma at the time of admission. He was treated with emulsion of turpentine and beef-essence; his condition improved somewhat for a while, but the diarrhœa continued until death. His mind was not clear at any time after admission.—Acting Assistant Surgeon W. G. Smull. [This man appears on the prescription-book of the 199th Pennsylvania volunteers as admitted to regimental hospital October 13, 1864, with acute diarrhœa. October 20th the entry, intermittent fever, appears opposite his name; October 23d, catarrh; October 25th, intermittent fever; October 26th, sent to field hospital. He appears on the register of the field hospital of the 10th Army Corps, admitted October 26th—intermittent fever—sent to Base hospital October 27th. He appears on the register of the Base hospital, 10th Army Corps, Jones's Landing, Virginia, admitted October 27th—intermittent fever; but there is no record of his disposition.] Died, January 23, 1865. *Autopsy* same day: Slight rigor mortis; considerable emaciation. There was about an ounce of serum in the subarachnoid space, about a drachm in each lateral ventricle, and a small quantity in the fourth ventricle; the substance of the brain was flaccid. The pericardium contained about two ounces of fluid. The heart was small and contracted; both sides contained white fibrinous clots, which extended on the right side into the pulmonary artery, on the left into the aorta. The lungs were dark-colored, and congested hypostatically; the upper lobe of the left lung was adherent to the thoracic parietes, its lower lobe to the diaphragm. The stomach was flaccid, its mucous membrane grayish. There were patches of congestion in the jejunum and ileum, especially the latter. The mucous membrane of the cæcum and ascending colon was thin, and presented large spots of congestion; in the transverse colon there were a number of ulcers which corresponded in position to the line of one of the longitudinal muscular bands. The sigmoid flexure and the upper part of the rectum were studded with small whitish ulcers. The liver was small and hard; the gall-bladder contained some light-colored bile. The spleen was a little larger than normal, tough, dark-colored, and full of blood. The kidneys were congested; the urine slightly albuminous.—Assistant Surgeon George M. McGill, U. S. A.

CASE 195.—Private John Jordan, company H, 173d New York volunteers; age 30; admitted December 21, 1864. Chronic diarrhœa. [This man appears on the register of the hospital of the 173d New York as having been treated for malarial fever in April, 1864, while the regiment was at Alexandria, Louisiana, and for diarrhœa and fever from November 24th to December 6th at Camp Russell, Virginia.] He stated that he had been suffering from diarrhœa for two months. His tongue was dry and thickly coated; skin dry and yellow; bowels moved nearly every hour. Enlargement of the liver was diagnosticated. He was treated with small doses of blue mass combined with vegetable astringents, but the diarrhœa was not checked by these measures. January 17, 1865: Symptoms of pneumonia on the right side were observed; counter-irritants were applied and stimulants administered. Died, January 31st.—Acting Assistant Surgeon J. G. Keller. *Autopsy* twenty hours after death: Body extremely emaciated. Brain normal; it weighed thirty-eight ounces and a half. Heart pale and flabby. The lungs were unusually black, and contained a number of small abscesses; the right lung was œdematous, and contained, besides the abscesses, a few miliary tubercles. The right lobe of the liver was adherent to the diaphragm; just below the adhesions was a large firm-walled abscess containing about a quart of gray odorless pus; the gall-bladder was quite full of yellow bile. Spleen very firm and dark-red; it weighed nine ounces and a half. Kidneys light-colored; weight six ounces each. The ileum was somewhat congested, and there were a number of small dark-bottomed ulcers in its lower portion, but Peyer's glands were not diseased. The colon was ulcerated; in the transverse and descending colon the ulcers were circular, a line or two in diameter, and most of them had dark bottoms.—Assistant Surgeon George M. McGill, U. S. A.

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* Assistant Surgeon McGill was subsequently transferred to the Hicks hospital, Baltimore, Maryland, where he printed the accounts of twenty-three additional *post mortem* examinations. These, with the sixty-one referred to in the text, were bound under the title "Observation Book—*Ante-mortems* and *Post-mortems*." Of this little work its author says: "This book is only a printed note-book intended for the Surgeon-General's Office, and for the officers of National and Hicks hospitals, who have desired copies. Criticism upon it, therefore, would be wholly out of place." In using the material contained in this Observation Book, considerable condensation has been necessary, and some corrections of names and dates have been supplied by the register of the hospital.

CASE 193.—Private John E. Stover, company C, 62d New York volunteers; age 45; admitted from the army of the Potomac October 22, 1864. Chronic diarrhœa. [It appears from the list of wounded of the 3d Division, 6th Army Corps, that this man received a gunshot flesh wound of the right knee, May 5, 1864, during the battle of the Wilderness, Virginia. The register of the Emory hospital, Washington, D. C., shows that he was admitted for this wound May 17th, and returned to duty July 3d. It appears by the register of the Sheridan field hospital, Winchester, Virginia, that he was admitted to that hospital from the field hospital of the 2d Division, 6th Army Corps, September 30, 1864, suffering with diarrhœa, and sent to general hospital October 18th.] According to his own statement he had also suffered from intermittent fever. When admitted he had frequent slimy dejections, which were partially fæcal, but no chills. He was treated with quinia, tannin, and morphia, and improved at first, but the diarrhœa recurred at intervals, and various tonics and mineral astringents were tried without effect. He constantly complained of pain in the lower portion of the abdomen; his appetite was capricious; at times there was some mental aberration. Twenty-four hours before death he was attacked with convulsions. Died, February 24, 1865.—Acting Assistant Surgeon W. G. Smull. *Autopsy* six hours after death: Body much emaciated; rigor mortis slight. There were two ounces of fluid in the subarachnoid space; the brain weighed forty-two ounces, and was somewhat congested; on the floor of the fourth ventricle a reddish V-shaped discoloration was observed; the middle commissure of the brain was wanting. Both pleural sacs contained much serum. The left lung weighed eleven ounces; the posterior portion of its lower lobe was congested hypostatically. The right lung contained a calcareous nodule, but was otherwise healthy; it weighed eleven ounces. The surfaces of both lungs presented an excess of pigment. The heart weighed six ounces; the lining membranes of the pulmonary artery and of the aorta were reddened; there were no heart-clots; the pericardium contained a small quantity of serum. The liver was cirrhosed; it weighed twenty-seven ounces. The spleen was firm, pale externally, its capsule thickened; internally it was dark-violet, the trabeculæ distinct; it weighed four ounces. Pancreas reddish; weighed one ounce. The small intestine, and the greater portion of the large intestine, appeared to be normal. The sigmoid flexure and rectum were greatly thickened, the rectum being about four lines thick; in the sigmoid flexure the mucous membrane presented a white rough patch and a region of ulceration; one of the ulcers in the upper part of the sigmoid flexure penetrated to the muscular coat.* Kidneys normal; weighed three ounces and a half each. One of the suprarenal capsules was large, yellowish-white externally, dark cherry-colored internally.—Assistant Surgeon George M. McGill, U. S. A. [No. 616, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon, presenting follicular ulcers and superficial excavations.]

CASE 197.—Private John Atwater, company I, 44th Ohio volunteers; age 22; admitted from Annapolis, Maryland, March 11, 1865. Chronic diarrhœa. [This man appears on the register of the 1st division of the Annapolis hospital, Maryland, as admitted from Wilmington, North Carolina, March 8, 1865—acute pneumonia—sent to Baltimore March 11th. The diagnosis on the register of the National hospital, Baltimore, is typhoid fever.] He stated that his disease commenced about two months previously, while he was a prisoner of war. When admitted he was extremely feeble; his tongue red and glazed; the entire abdomen tender. His discharges were lienteric, the undigested food being mixed with a large quantity of sero-mucous fluid. Mineral and vegetable astringents, combined with tonics and stimulants, were tried without effect. Died, March 22d.—Acting Assistant Surgeon W. G. Smull. *Autopsy* forty-eight hours after death: Body greatly emaciated; some slight rigor mortis. The pia mater was moderately congested; on section of the brain substance the cerebral puncta appeared more numerous on the left side than on the right; the brain weighed forty-five ounces The heart weighed eight ounces and a quarter; both sides contained white fibrinous clots, which, on the right side, extended into the pulmonary artery. The lower and posterior portions of the right lung contained a number of consolidated lobules—(lobular pneumonia?) the left lung was congested posteriorly, and ecchymosed spots were observed beneath the pleura of the lower lobe; the right lung weighed twenty-five ounces, the left seventeen ounces. The liver was friable, presented a marked nutmeg appearance, and weighed forty-eight ounces; the gall-bladder was filled with thick black bile. The spleen weighed seven ounces. The pancreas weighed four ounces. The stomach was congested; the lower part of the jejunum slate-colored. Peyer's patches were not diseased. The cæcum was congested. The solitary glands were enlarged, and marked with black pigment in the cæcum and ascending colon. In the transverse colon there were large irregular ulcers, which, as a rule, were found in the pouches of the colon. In the descending colon and rectum the ulceration had destroyed almost the whole surface of the mucous membrane, leaving many intact islets in the midst of the ulcerated tract, the whole, when viewed from a little distance, having the appearance of coarse granulations; the submucous and muscular coats of the ulcerated portions of the gut were much thickened. The mesenteric glands were slightly enlarged. The kidneys were light-colored, congested inferiorly; the right weighed five ounces and a quarter, the left four and a half.—Assistant Surgeon George M. McGill, U. S. A.

CASE 198.—Corporal John McEwart, company D, 7th New York volunteers; age 28; admitted from Annapolis, Maryland, March 11, 1865. Chronic diarrhœa, contracted while a prisoner of war. [The register of the 1st division of the Annapolis hospital, Maryland, shows that this man was admitted from Aiken's Landing February 26, 1865, with chronic diarrhœa, and sent to Baltimore March 10th.] When admitted he was pale and emaciated, pulse small and feeble, tongue white in the centre and red toward the edges; the abdomen was tender and somewhat painful; the stools were fluid, dark, and offensive, averaging ten or twelve a day; his appetite was good. Opium and acetate of lead, vegetable astringents and tonics, were fruitlessly prescribed. Died, March 24th.—Acting Assistant Surgeon J. G. Keller. *Autopsy* fourteen hours after death: Body greatly emaciated; rigor mortis slight. There was a considerable quantity of fluid in the subarachnoid space, and in the ventricles of the brain; numerous puncta vasculosa appeared on section of the cerebrum; the brain weighed forty-nine ounces. There were old pleuritic adhesions on both sides. The surface of both lungs was freely sprinkled with black pigment; the right lung was congested posteriorly, and on section of the lower lobe several ecchymosed spots were observed; the posterior part of the lower lobe of the left lung was in a state of red hepatization, and presented, superficially, several ecchymosed spots;

* Dr. McGill, in a note to this case, says of the rectum and sigmoid flexure: "The specimen was considered one of cancerous disease, although no microscopic examination was made of it." It is difficult to imagine what induced this notion.

the right lung weighed twenty ounces and a half, the left fifteen and a half. The heart weighed five ounces and six-eighths; there were fibrinous clots in both sides, extending into the aorta and pulmonary artery. The liver was firm, bronzed, and weighed twenty-eight ounces; the gall-bladder was filled with amber-colored bile. The spleen weighed three ounces and a half. The pancreas weighed seven ounces [?]. The stomach was slightly congested. There were regions of congestion in the jejunum and ileum. In the colon were a number of round and oval ulcers, which penetrated to the submucous tissue; between the ulcers the mucous membrane was dark-slate colored. The kidneys weighed four ounces each. The suprarenal capsules were large and light-colored.—Assistant Surgeon George M. McGill, U. S. A.

CASE 199.—Private Abram J. Stokes, company C, 120th New York volunteers; age 23; admitted February 21, 1865. Consumption. [The records of the depot field hospital, 2d Army Corps, show that this man was admitted February 2, 1865—diagnosis, inflammation of the lungs—sent to general hospital February 20th.] When admitted he was considerably emaciated; cheeks suffused with a hectic flush, eyes prominent, conjunctivæ injected. He coughed almost incessantly, and was slightly hoarse; complained but little of pain in the chest; had but little appetite, and after taking food frequently ejected it during a fit of coughing. Colliquative diarrhœa and night-sweats persisted during the case. Died, March 23d.—Acting Assistant Surgeon W. G. Smull. *Autopsy* thirty-six hours after death: Body not much emaciated; no rigor mortis. The pia mater was somewhat congested; but little fluid was found in the subarachnoid space; there was a small quantity of limpid serum in both lateral ventricles; on section of the cerebrum numerous puncta vasculosa were observed; the right side of the floor of the fourth ventricle presented some arborescent congestion; the substance of the cerebellum was softer than that of the cerebrum; the brain weighed forty-nine ounces. The right lung was congested, contained miliary tubercles, and had a vomica posteriorly in its upper part; its lobes were united by adhesions; the pleura covering it was irregularly thickened; the left lung was coated with lymph, its lobes interadherent; its upper lobe contained an immense number of miliary tubercles; the right lung weighed forty ounces, the left thirty-three ounces. The heart was flabby, and weighed fifteen ounces and a quarter; its right side contained a large white clot, the left side mixed clots. The liver weighed sixty-three ounces, and was of a light-red color; the gall-bladder was filled with black bile. The spleen weighed six ounces and a quarter; there were some minute bodies resembling tubercles on the dorsum of the organ. The pancreas weighed three ounces and five-eighths. Some ecchymosis was observed in the fundus of the stomach. White bodies resembling tubercles were found in Peyer's patches. The mucous membrane of the large intestine presented regions of hyperæmia, between which the mucous membrane was slate-colored. The kidneys were flabby and light-colored; the left weighed seven ounces and a quarter, the right five and a quarter. The suprarenal capsules were somewhat dark in color, but apparently healthy.—Assistant Surgeon George M. McGill, U. S. A.

The six following cases are from the HICK'S HOSPITAL, Baltimore, Maryland, Surgeon Thomas Sim, U. S. V., in charge. The autopsies were made by Assistant Surgeon George M. McGill, U. S. A., and were reported in his "Observation Book." See note, page 125:

CASE 200.—Private John Hillman, company E, 28th Indiana volunteers; admitted August 6, 1865. Chronic diarrhœa. [The diagnosis on the register is typhoid fever.] At the date of admission this man had from thirty to forty stools a day, with involuntary evacuations during sleep; pulse frequent; tongue dry. Died, August 8th. *Autopsy* twelve hours after death: Body but slightly emaciated; rigor mortis great. The pia mater was congested; there were several small stellate spots resembling extravasations of blood on the floor of the fourth ventricle; the brain weighed fifty-five ounces. The heart was flabby and of a blood-red color; it weighed nine ounces and a half; there was a white clot in the right side, which extended into the pulmonary artery; there was slight atheroma of the aorta, and some induration of the attachments of the aortic valves. Both lungs were congested posteriorly, and presented in the congested portion a few consolidated lobules; on the right side several of the consolidated lobules were infiltrated with a purulent fluid; the left lung weighed twenty-five ounces, the right twenty ounces. The liver weighed sixty-four ounces; the gall-bladder was filled with black bile. The spleen weighed six ounces. The kidneys weighed five ounces each. The suprarenal capsules were normal. The omentum was thickened and adherent to the intestines. The opposed surfaces of the knuckles of intestine generally were agglutinated with lymph. The mucous membrane of the stomach was congested, especially in the fundus. The duodenum and upper portion of the jejunum were ash-colored and flabby; the lower portion of the jejunum was congested, and presented deep transverse ulcers parallel to the valvulæ conniventes and between them; these ulcers invaded the muscular coat; their sites were indicated externally by peritoneal opacity and adhesions; although generally between the valvulæ conniventes, they sometimes extended over them, and sometimes penetrated through them so as to leave bridges of mucous membrane; in the lowest part of the jejunum, and in the ileum, the ulcers were oval; a greenish-yellow lymph adhered to some of them. The mucous membrane of the large intestine was hyperæmic in regions, and in the sigmoid flexure frosted with minute granules of lymph, which firmly adhered to the congested mucous surface.—Assistant Surgeon George M. McGill, U. S. A.

CASE 201.—Private Reuben Collins, company E, 45th United States colored troops; admitted from McKim's Mansion hospital July 24, 1865. Debility. [This man appears on the register of McKim's Mansion hospital, Baltimore, Maryland, as admitted from field hospital June 26, 1865, with chronic peritonitis.] He was feeble and emaciated; his mind obtuse, bowels loose, abdomen tender. Died, August 15th. *Autopsy* six hours after death: The substance of the brain was soft; a quantity of reddish fluid was found in the left lateral ventricle; in the left choroid plexus, about an inch from the foramen of Monro, was a mass of white granular caseous material resembling tubercle; the brain weighed forty-two ounces. The right lung weighed twenty-one ounces, the left twenty-four ounces; no tubercles in either. The bronchial glands were enlarged and dark. The heart was normal both auricles contained dark clots; in the ventricles there were small white clots, which extended into the aorta and the pulmonary artery. Old peritoneal adhesions connected the liver to the abdominal parietes; on section the liver was dark-red, and contained a large number of saccules, which varied from the size of a grape-seed to that of a bean, and

contained a semi-fluid granular matter. The liver weighed fifty ounces. The spleen weighed four ounces; it was firm, dark-colored, and contained a single deposit of tubercle of some size. Both kidneys contained tubercles; the right weighed five ounces, the left four ounces and a half. Two ulcers were observed in the ileum. In the ascending colon and the sigmoid flexure there were a moderate number of oval, deep, irregular ulcers. The intestinal walls were readily torn. The greater omentum was thickened and studded with tubercles.—Assistant Surgeon George M. McGill, U. S. A.

Case 202.—Private Henry Beyer, company K, 1st Maryland volunteers; a discharged soldier; admitted from Jarvis hospital July 26, 1865. Typhoid fever (?), followed by chronic diarrhœa. He became much emaciated, and about ten days before his death pus was observed in the anterior chamber of the right eye. Died, August 22d. *Autopsy:* Body emaciated; no rigor mortis; suggillation posteriorly. Pia mater congested; commissura mollis absent; the brain weighed fifty ounces and one-eighth. The posterior portion of the upper lobe of the right lung was in a state of gray hepatization, the lower lobe congested; there was a group of consolidated lobules in the anterior portion of the upper lobe of the left lung; the posterior portion of the lower lobe was semi-solidified and ecchymosed; the right lung weighed twenty-one ounces, the left eighteen ounces. The heart weighed eight ounces; there was a white clot in its right side, a black one in its left. The liver was of normal consistence, full of blood, and weighed fifty-six ounces; the gall-bladder contained about three ounces of yellowish bile. The spleen weighed six ounces and a half; the pancreas one ounce. The kidneys were rather soft; the right weighed eight ounces, the left six ounces. The suprarenal capsules were small. The stomach was large and much discolored. The jejunum discolored with bile. The large intestine thin; its mucous membrane in regions was congested and of a rich purple color.—Assistant Surgeon George M. McGill, U. S. A.

Case 203.—Private John Brooks, company A, 146th Indiana volunteers; admitted August 12, 1865. Acute dysentery. This man was on duty in the guard of the hospital when taken sick. When admitted he had frequent discharges from the bowels, and bilious vomiting; pulse 108 and full; tongue coated in the centre. He complained of pain in the epigastric region, especially after vomiting. August 19th: The discharges are bloody and very frequent; hiccough is very troublesome. August 23th: Had a profuse hæmorrhage from the bowels last night. August 30th: The patient is comatose, the stools black, offensive, and passed involuntarily. Treatment: Counter-irritation to the abdomen, alteratives and anodynes, lead and opium, stimulants; during the last ten days large doses of opium and astringent enemata. Died, September 1st. *Autopsy* twenty hours after death: Body not much emaciated; rigor mortis slight. There was some congestion of the pia mater posteriorly; the brain apparently normal; it weighed forty seven ounces. The heart was flabby, and weighed nine ounces and three-quarters. The right lung weighed thirteen ounces; its lower lobe was congested posteriorly; the left lung was normal; it weighed fourteen ounces. The liver weighed sixty-four ounces; numerous little yellowish-white nodules were scattered through its substance, the largest about the size of peas. The spleen was firm, and weighed seven ounces and a half. The pancreas weighed two ounces and a half. The right kidney weighed five ounces and a half, the left seven and a half. The intestines were ash-colored externally. The mucous membrane of the stomach was discolored in patches. The patches of Peyer presented the "shaved-chin" appearance. In the upper part of the ileum a granular matter adhered to the valvulæ conniventes; in some places it was pale, in some brownish; lower down, light-colored patches, resembling superficial ulcers, were associated with the Peyer's patches; just above the ileo-cæcal valve the ileum was honeycombed by a large number of ulcers, which penetrated to the muscular coat. Throughout the large intestine there were many deep ulcers, between which the mucous membrane was of a deep cherry-red color. The coats of the intestine were readily torn.—Assistant Surgeon George M. McGill, U. S. A.

Case 204.—Private John Whalen, company G, 3d New York volunteers; age 30; admitted August 31, 1865. Dysentery of about four days' duration. According to the statement of the patient, he was taken sick while with his regiment on its way from Raleigh, North Carolina, to New York. When the regiment reached Baltimore he was sent to hospital, having taken no remedies before his admission. He had considerable symptomatic fever when admitted; the tongue was thickly coated with a light-brown fur; there were dark sordes on the teeth; the stools were watery, dark-colored, mixed with blood, and had a highly offensive and sickening odor; the abdomen was tender, and there was severe tenesmus. The day after admission the fever subsided, and the extremities became cold. He was delirious at night, especially on the alternate nights. Treatment: When first admitted a dose of castor oil and laudanum was given; subsequently tannic acid and opium, injections of acetate of lead, and acetate of morphia, &c. Stimulants were administered freely. Died, September 6th. *Autopsy:* Muscles well developed; rigor mortis marked. Pia mater injected; brain-substance normal; the brain weighed forty-nine ounces. Pleuritic adhesions existed on both sides. There was some deposit of tubercle in the upper portion of each lung; in the left lung the tuberculous masses were of considerable size, and the lung-tissue surrounding them was solidified; the tubercular deposit was firm, and no cavities had formed; both lungs contained much black pigment; the right lung weighed twelve ounces and a half, the left fourteen ounces. The heart weighed ten ounces and a half; white clots were found in both sides. The liver weighed eighty-six ounces; on section it was light-colored; on the upper surface of the left lobe were two depressions resembling cicatrices. The spleen was firm, and weighed seven ounces. The pancreas weighed three ounces and a half. The right kidney weighed five ounces, the left six ounces. The suprarenal capsules were large. The mucous membrane of the stomach was congested and of a scarlet color. The jejunum contained a yellowish, viscid, jelly-like substance, which became dark-colored lower down; in the lower part of the jejunum and upper part of the ileum the mucous membrane was of a dark purple; lower down were numerous minute, circular, superficial ulcers, to which a light-gray pseudomembrane adhered. The large intestine was thickened and coated with greenish-yellow pseudomembrane from the cæcum to the rectum; at points where this layer was deficient the mucous membrane was dark purple.—Assistant Surgeon George M. McGill, U. S. A.

Case 205.—Private Michael Mulvey, company H, 2d Massachusetts heavy artillery; admitted September 10, 1865. Chronic diarrhœa. The patient stated that he had suffered from an attack of fever, from which he had convalesced very slowly; subsequently he was attacked with dysentery. He was somewhat emaciated, pulse quick, appetite poor; had five to ten bloody stools daily. September 15th: He complained of violent pain in the abdomen. Treatment: Anodynes, astringents, stimulants,

milk diet. Died, September 22d. *Autopsy* ten hours after death: Body emaciated; rigor mortis decided. The brain weighed three pounds; its substance was firm; some congestion of the floor of the fourth ventricle was observed; there was a considerable quantity of subarachnoid fluid. There were numerous old pleuritic adhesions on the right side. The lobes of the left lung were interadherent and the upper lobe adhered to the thoracic parietes; a number of ecchymosed spots were observed on the surface of the right lung and the upper lobe of the left; the right lung had but two lobes, and contained a single white cheesy nodule near its apex; the right lung weighed sixteen ounces, the left eleven ounces. The bronchial glands contained much black pigment, but were of normal size. The heart weighed nine ounces and a half; there was a white clot in its right side, a black one in the left. The liver contained a considerable number of metastatic foci, many of which had softened into a peruloid liquid; it weighed sixty ounces and a half; the gall-bladder contained some greenish bile. The spleen weighed fifteen ounces. The jejunum was congested in regions; about half way down the ileum, transverse ulcers made their appearance, situated on the side of the mesenteric attachment; these became more numerous and deeper lower down, and were associated with thickening of the intestinal wall. The large intestine was extensively ulcerated, the ulcers being largest and deepest in the descending colon. The right kidney weighed five ounces, the left six ounces. The suprarenal capsules weighed three-quarters of an ounce each.—Assistant Surgeon George M. McGill, U. S. A.

The following case was forwarded on a descriptive list from McKim's Mansion Hospital, Surgeon S. D. Freeman, U. S. V., in charge:

Case 206.—Private Edwin Powers, company H, 7th Indiana volunteers; aged 23; admitted August 27, 1863. Dysentery. This man was attacked with dysentery while at Camp Bradford, Maryland, some three weeks previously. The camp was at the time notorious for its filthy condition. When admitted he was extremely emaciated, his eyes sunken, conjunctivæ congested; he complained of supraorbital pain; his tongue was coated, his throat dry; the evacuations averaged six daily; the extremities were cold; pulse quick but weak. Treatment: Pills of nitrate of silver and opium; beef-essence and milk-punch. August 30th: Add three grains of sulphate of quinia three times daily. August 31st: Had four or five stools during the night; vomited in the morning after eating; the abdomen is tender on pressure. September 2d, 9 A. M.: Pulse 120; tongue coated; skin hot; bowels moved only once since yesterday. 5 P. M.: Singultus and vomiting; refuses everything but milk-punch; the passages are involuntary. Died, September 3d. *Autopsy* three hours after death: An ulcer of the cornea was observed in each eye. The ileum was lined with a greenish secretion, and appeared slightly inflamed just above the ileo-cæcal valve. The descending colon was inflamed, and coated with a yellowish diphtheritic deposit. The rectum was of a very dark color, and ulcerated near the anus. The kidneys were enlarged; one of them weighed seven ounces.—Medical Cadet C. W. L. Bradley.

The histories of the six following cases are from the case-book of the Jarvis Hospital, Baltimore, Maryland, Assistant Surgeon DeWitt C. Peters, U. S. A., in charge. The autopsies were made by Acting Assistant Surgeon B. B. Miles:

Case 207.—Private Rufus A. Egerton, company F, 1st Vermont cavalry; a paroled prisoner; age 26; admitted September 16, 1862. Chronic diarrhœa. Died, November 4th.—Acting Assistant Surgeon B. B. Miles. [No. 227, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon, which is somewhat thickened, and presents a number of follicular ulcers, some of which have extended into irregular jagged excavations.]

Case 208.—Private Gilbert F. Sherwood, company K, 144th New York volunteers; admitted July 20, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 12th New York volunteers, Warrenton Junction, Virginia, as having been under treatment for diarrhœa during the early part of the month of July, and sent to general hospital July 11th.] About August 1st his case assumed a typhoid type, and a low delirium set in, which was somewhat relieved by a large fly-blister over the epigastrium, and ice to eat or suck constantly. In the treatment of the diarrhœa Hope's camphor mixture and muriatic acid were used in conjunction with tonics, quinia, beef-tea, barley-water, &c. Died, August 21st.—Acting Assistant Surgeon F. Hinkle. *Autopsy* twelve hours after death: The mucous membrane of the whole intestine was inflamed, especially in the caput coli and the last twenty inches of the ileum; it presented a deep-red velvety appearance, with many small ulcers.—Acting Assistant Surgeon B. B. Miles. [No. 76, Medical Section, Army Medical Museum, is from this case. The specimen consists of the last four inches of the ileum and a part of the cæcum; the ileum is thickened and ulcerated; the ulcers, about twenty in number, extend through the submucous connective tissue to the muscular coat; they vary from one to eight lines in long diameter, their edges rounded, thickened, and overhanging. In the cæcum there are a number of small follicular ulcers.]

Case 209.—Private William Hughes, company E, 29th Missouri volunteers; age 30; a paroled prisoner; admitted from Richmond, Virginia, April 18, 1864. Chronic diarrhœa. Died, May 9th. *Autopsy* twenty-four hours after death: The whole of the right lung was hepatized and everywhere adherent to the thoracic parietes; the left lung was very much congested, partly hepatized, and presented slight pleuritic adhesions. The heart was pale and flabby. There was about a quart of pus in the peritoneal cavity. The intestines were extensively congested. The spleen was soft. The kidneys were large and congested.—Acting Assistant Surgeon B. B. Miles.

Case 210.—Private G. R. Everts, company G, 2d East Tennessee volunteers; paroled prisoner; age 22; admitted from Richmond, Virginia, April 18, 1864. Diarrhœa and starvation. Died, May 3d. *Autopsy* twenty-four hours after death: A large cavity was found in the middle lobe of the left lung. There were two quarts of serum in the left pleura, pushing the heart to the right side. There was also a cavity in the middle lobe of the right lung; the upper lobe was consolidated by deposition

of tuberculous matter. The right lung was everywhere bound to the thoracic parietes by pleuritic adhesions. The heart was flabby and pale, but normal in size; the aortic valves were thickened. The spleen was soft and friable. The gall-bladder was empty. There was general peritonitis, with effusion of pasty lymph, involving especially the lower part of the ileum and the caput coli. The solitary follicles of the small intestine were ulcerated. The lower part of the ileum was gangrenous (?) and the whole of the rectum was in the same condition. Acting Assistant Surgeon B. B. Miles. [Nos. 307 and 308, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the ileum, with well-marked valvulæ conniventes. Peyer's patches and some of the solitary follicles are ulcerated. The peritoneal surfaces of both pieces are coated with croupous lymph.]

CASE 211.—Private James Turvey, company C, 14th Kentucky volunteers; age 21; admitted from general hospital, Annapolis, Maryland, November 28, 1864. Chronic diarrhœa. [This man appears on the register of the hospital steamer Atlantic as admitted November 20th; sent to Annapolis November 25th. He is borne on the register of the 1st division of the Annapolis hospital as admitted from Savannah, Georgia, November 25th, and sent to Baltimore November 27th. No diagnosis is recorded in either register.] Died, December 19th. *Autopsy* twenty-four hours after death: The lungs and heart were normal. The liver was very much congested, and the gall-bladder largely distended with bile. The spleen was large and congested. The transverse colon was everywhere adherent to the peritoneum; at the upper part it was perforated, and fæcal matter had been discharged into the abdominal cavity, inducing gangrenous peritonitis. About four ounces of fluid were found in the peritoneal cavity. The mucous membrane of the whole colon was extensively ulcerated.—Acting Assistant Surgeon B. B. Miles.

CASE 212.—Private Horatio G. Perkins, company D, 2d Connecticut heavy artillery; age 27; admitted from general hospital, Winchester, Virginia, November 5, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital of the 1st Division, 6th Corps, as admitted October 24th—remittent fever—and sent to general hospital November 3d. He is borne on the register of the Sheridan depot field hospital, Winchester, Virginia, as admitted November 3d—chronic diarrhœa—and sent to general hospital November 4th.] Died, January 9, 1865. *Autopsy* twenty-four hours after death: The upper lobe of the right lung was adherent to the costal pleura, and contained a large tuberculous cavity with irregular edges; the whole lung was infiltrated with tuberculous matter; the left lung was normal. The cavities of the heart were filled with fibrinous clots. The intestines were much contracted, and in different parts considerably congested, but no ulcerations could be found. The mesenteric glands were enlarged and filled with tuberculous matter. The liver and spleen were normal. Both kidneys presented evidences of fatty degeneration, and were much hypertrophied.—Acting Assistant Surgeon B. B. Miles.

## The three following cases were forwarded on medical descriptive lists from PATTERSON PARK HOSPITAL, Baltimore, Maryland, Surgeon Thomas Sim, U. S. V., in charge:

CASE 213.—Private William Keighley, company A, 29th Maine volunteers; age 43; admitted August 1, 1864. Dysentery. [This man appears on the register of the general hospital, Frederick, Maryland, as admitted from the field July 30, 1864—hæmorrhoids—sent to Baltimore August 1st.] The patient was a man of intemperate habits, and was considerably emaciated. Pills of acetate of lead and opium were prescribed at first; subsequently pills of blue mass, opium and ipecacuanha, and pills of quinine, opium and ipecacuanha. Diet: Milk, vegetable soup, and stimulants. August 10th: He passed about twenty feet of tape-worm, after which he appeared easier. August 20th: From the renewal of the symptoms it was suspected that a considerable length of the tape-worm still remained, or that perhaps a perforation of the intestines had taken place. Died, August 25th. *Autopsy:* The colon was extensively inflamed and ulcerated. In the ascending colon two perforations were found. No remaining portions of the tape-worm could be discovered.—Acting Assistant Surgeon P. S. Kinnerman.

CASE 214.—Private J. N. Keeton, company D, 2d Virginia cavalry; age 19; admitted October 25, 1864. Chronic dysentery. [This man appears on the register of the Sheridan depot field hospital, Winchester, Virginia, admitted from the field October 9, 1864—debility—sent to general hospital October 10th.] The patient stated that he had been sick with dysentery some two or three weeks; also, that he had an attack of the same disease six or eight months previously, from which he never entirely recovered. His passages are still slimy and bloody. ℞. Castor oil two ounces, tincture of opium two drachms. Take a teaspoonful every three hours. October 27th: Is not much improved, but his passages are less frequent; he has had only four during the last twenty-four hours. He is certain that he will not recover, and is very melancholy. Ordered injections of starch-water and laudanum. October 30th: There has been no improvement. ℞. Dover's powder eighteen grains, blue pill ten grains; make nine pills. Take one every four hours. November 5th: To take quarter of a grain of opium in pill three times a day; low diet. November 12th: Seems about the same; has a little more appetite. To take ten drops of chlorodyne every four hours; half diet. December 8th: The patient seemed to improve for a time while taking the chlorodyne, but it has now lost its effect, and he is as ill as before taking it. ℞. Subcarbonate of bismuth half a drachm, Dover's powder ten grains, white sugar half a drachm; make twelve powders. Take one three times a day. January 19, 1865: There has not been much change. Sometimes the bowels are checked for two or three days, when he always complains of great abdominal pain; then the passages of blood and mucus return as before. He begs for anodynes constantly. January 21st: Renewed the injections of laudanum and starch. February 16th: No better. Apply a blister, five inches square, to the surface of the abdomen. March 6th: The patient, who has thus far been able to sit up a while nearly every day, now says he has not strength enough to do so; nevertheless, he gets up on the vessel when necessary. He constantly complains of pain in the bowels and wants anodynes. To take the third of a grain of opium four times daily. Died, March 15th. The symptoms had continued without much change until a few hours before death, when his countenance became very pallid, and consciousness departed. *Autopsy* eighteen hours after death: No rigor mortis. The lower portion of the ileum was congested. The mucous membrane of the colon was thickened and of a very dark-blue color, except about six inches of the descending colon, which were ulcerated. All the other viscera were normal.—Acting Assistant Surgeon Geo. W. Fay.

CASE 215.—Private James Martin, company E, 28th Massachusetts volunteers; age 18; admitted February 8, 1865, from City Point, Virginia. Chronic diarrhœa. [This man appears on the register of the hospital of the 1st Division, 2d Army Corps, as having been treated for acute diarrhœa during January, 1865, and sent to general hospital February 1st. He appears on the register of the depot field hospital, 2d Army Corps, City Point, Virginia, admitted February 2d—chronic diarrhœa—sent to general hospital February 6th, per steamer State of Maine.] When admitted he was extremely emaciated, the fæcal discharges occurring frequently and involuntarily; he was not expected to live through the day. To take a tablespoonful of brandy every two hours; hot water to feet. R. Chalk mixture one ounce, tincture of catechu and extract of hæmatoxylon of each one drachm. To take a teaspoonful of the mixture every four hours. February 10th: He seems easier, but the fæcal discharges are still frequent and involuntary. R. Brandy-toddy four ounces. Take a tablespoonful every four hours. February 14th: The patient seems to have more strength, but the diarrhœa is no better. R. Subnitrate of bismuth thirty grains; in three powders. Take one every four hours. Continue the brandy-toddy. February 16th: Is failing; discharges very frequent. R. Tannic acid sixteen grains, powdered opium two grains; make four powders. Take one every four hours; also a tablespoonful of brandy-toddy every two hours. Died, February 20th. *Autopsy:* The small intestine was very much congested throughout its entire length. The entire colon was disorganized by ulceration and sloughing, the external coat alone seeming to hold it together; at the junction of the transverse and descending colon there was a large perforation. No abdominal tenderness had been observed during life.—Acting Assistant Surgeon W. Kempster.

The next five cases were reported on medical descriptive lists from the first division of the ANNAPOLIS HOSPITAL, Maryland, Surgeon Bernard A. Vanderkieft, U. S. V., in charge:

CASE 216.—Private John B. Stever, company D, 116th Illinois volunteers; age 30; admitted August 22, 1863. Dysentery. This patient was first seen by the reporter September 9th. He was then suffering with dysentery. He had frequent desire to go to stool, with great straining, small evacuations, and complained of soreness at the anus; was very much debilitated and emaciated, nevertheless his appetite was remarkably good. The stools were light-yellow, flocculent, and mixed with blood and mucus; they had a fetid odor. To take five grains of subnitrate of bismuth and a quarter of a grain of calomel three times a day. Beef-tea, rice-jelly. September 14th: The disease continues unchecked. To take every four hours a pill containing quarter of a grain of nitrate of silver, half a grain of opium, and two grains of quinine. September 21st: Seems to be improving slowly. To take pills of quinine and morphia, injections of tannic acid in starch-water, and twice daily a raw egg with brandy. October 1st: Seems very much better; had but two stools in the last twenty-four hours, and these apparently more natural. Continued treatment. October 25th: Still improving; is able to sit up; appetite good. To take pills of nitrate of silver, quinine, and opium; beef-steak. October 26th: Has an attack of double pneumonia; expectoration viscid and rusty; considerable crepitation and dulness over both lungs; much cough; pulse small, 110; skin hot. R. Tartrate of antimony and potassa two grains, water two ounces. Take a teaspoonful every hour. Beef-tea, Irish-moss jelly, flaxseed tea. October 28th: Complete flatness on percussion; very little expansion of the lungs; is so much debilitated that he has no power to expectorate; no heat of skin; pulse 90 and feeble. Stop the antimonial. Apply a blister, six inches by ten, to the chest. Half a grain of calomel and one-sixth of a grain of ipecacuanha every two hours. Brandy and egg. October 31st: Sinking very rapidly; takes no nourishment; pulse intermittent; involuntary evacuations. Died, November 1st. *Autopsy* sixteen hours after death: Both lungs were hepatized and softened, the right being much softer than the left. The heart was very small; its walls thin. The liver, spleen, and kidneys were normal. The stomach was very much distended with mucus, and contained some pus. The intestines were inflamed; the large intestine was considerably ulcerated and thickened.—Acting Assistant Surgeon J. M. Longnecker.

CASE 217.—Private James E. Griffing, company D, 127th New York volunteers; age 20; admitted October 29, 1863. Pleuro-pneumonia. This man was captured near Goose Creek, Virginia, July 21, 1863; sent to Belle Isle, Virginia, arriving there July 25th. Was badly treated; lay out in the rain and dew for three weeks on sand which was full of vermin; had only a coat, shirt, and pants for protection; was barefooted the whole time. Became worn down by diarrhœa, and when admitted to this hospital was very much emaciated and full of vermin. He had severe diarrhœa, a bad cough, and complained of a sharp pain in the left side; could not draw a long breath; his tongue was red and glazed. There was dulness on percussion over most of the left and part of the right lung; bronchial respiration, with some friction sound, was heard. Ordered warm mustard foot-baths; sinapisms to the left side over the seat of pain; a cough mixture, milk-punch, extra diet. October 31st: Says he feels much better; pain nearly gone; diarrhœa not quite so bad. Continued treatment. November 1st: The pain in the left side is worse again; respiration difficult; bowels quite loose; pulse feeble; tongue red. Physical signs as when admitted. Repeat mustard to side and cough mixture; also to take two grains and a half of Dover's powder and two of acetate of lead every four hours. November 3d: The pain is easier, but the bowels very loose; the patient is very feeble. Continue treatment. November 4th: Use the following as an injection: R. Starch-water one ounce, sulphate of morphia three-eighths of a grain, sulphate of quinia five grains. November 5th: He had but one passage since yesterday morning; the other symptoms are the same. Discontinue the injections. November 7th: Is much weaker; can scarcely speak; pain in the chest more severe; coughs feebly; respiration difficult; pulse 90; had four stools during the night. Died at 11 A. M. *Autopsy* twenty-seven hours after death: Almost the whole of the left lung was solidified; its surface was coated with lymph, and there were four ounces of serum in the pleural sac; the right lung was congested. The heart was very small. The liver was normal. The stomach small. The intestines were contracted. The lower portion of the ileum and most of the colon were much congested. No adipose tissue was observed, and the muscles of the body were pale and soft.—Acting Assistant Surgeon S. J. Radcliffe.

CASE 218.—Private Alfred Davis, company L, 6th Michigan cavalry; admitted from Richmond, Virginia, March 9, 1864. Chronic diarrhœa. This soldier was captured near Hagerstown, Maryland, July 12, 1863, and was held a prisoner of war by the enemy until March 7, 1864, when he was paroled, arriving here on the 9th. He stated that he was sick during the greater

portion of his imprisonment. He was excessively reduced, hardly more than a skeleton, and so weak he had to be carried from the boat to bed upon a stretcher. He had an exhausting diarrhœa, twelve stools in the last twenty-four hours, which were not painful, but he complains of constant pain in the back and lower extremities; the tongue was moist and clean; the pulse frequent and feeble; no appetite. ℞. Sulphate of quinia one scruple, sulphate of morphia one grain, dilute sulphuric acid two drachms, water five ounces. Take a tablespoonful every four hours; beef-tea and wine. March 12th: Condition much the same; the system does not respond to stimulants or medicines; pulse 120 and weak; there is slight tenderness in the right iliac region. Applied a mustard plaster to the abdomen. ℞. Ipecacuanha and opium, of each four grains, calomel three grains; make sixteen pills. Take one every four hours. March 14th: At the morning visit the condition of the patient was about the same. At the evening visit, 9 o'clock P. M., he was almost pulseless. Brandy and beef-tea were ordered to be taken alternately every hour. He died at 10 A. M. on the 15th. *Autopsy:* Body excessively emaciated; no rigor mortis. There were old pleuritic adhesions on the left side of the chest. The lungs were collapsed. The heart presented no abnormal appearance. The jejunum and ileum were much congested. The colon and rectum were thickened, and presented other evidences of chronic disease. The kidneys were healthy. Nearly all the tissues were unusually pallid.—Assistant Surgeon William S. Ely, U. S. V.

Case 219.—Private David Smith, company B, 46th Ohio volunteers; age 36; admitted from Richmond, Virginia, March 9, 1864. Chronic diarrhœa. This man was taken prisoner July 26, 1863, near Jackson, Mississippi, and held until March 7, 1864, when he was paroled, reaching Annapolis on the 9th. He has suffered exceedingly during his lengthened imprisonment, and comes to hospital much reduced, anæmic, and laboring under chronic diarrhœa of a severe type. Tongue deep-red; appetite poor; stools mucous and watery, averaging twelve a day; pulse 100 per minute, small and wiry. To take turpentine emulsion every four hours. March 15th: The countenance and complexion have acquired an icteroid hue, and there is tenderness on strong pressure in the right iliac region. ℞. Mercury with chalk eighteen grains, Dover's powder twenty grains, sulphate of quinia twelve grains; make six powders. Take one every four hours, alternating with the turpentine mixture previously ordered; brandy as required. Turpentine stupes to abdomen. March 17th, P. M.: Is evidently failing; stools every hour or two; pulse hardly perceptible and very compressible. Stop former medicines; give quinine, beef-essence, and brandy both by the mouth and by injection. March 18th: The stools are passed involuntarily. Died, March 19th. *Autopsy* thirty-six hours after death: Rigor mortis marked. Both lungs were strongly adherent throughout nearly their entire extent. The stomach contained a pint of bilious-looking fluid. The jejunum and ileum were congested in many places. The colon and rectum were much thickened, and studded with numerous ulcerations, some of which had almost perforated.—Assistant Surgeon William S. Ely, U. S. V.

Case 220.—Corporal Samuel Williams, company C, 11th Tennessee mounted infantry; age 31; admitted March 26, 1864. Chronic diarrhœa. The patient was a prisoner who arrived two days previously, in a very prostrate condition. His pulse was above 100, and so feeble that it could hardly be felt. He had over twenty loose discharges a day. To use enemata of starch and laudanum, and have four ounces of whiskey daily. March 29th: The diarrhœa has been a little better, but has become worse this morning. The discharges have a very fetid odor, and are tinged with blood. The pulse is somewhat stronger. Continue treatment. March 30th: Is still worse; the diarrhœa continues unchecked; the pulse is accelerated to 125; he has no appetite; complains of headache and great pain in the bowels. ℞. Acetate of lead two grains, sulphate of morphia one grain, sugar one drachm; make eight powders. Take one every four hours. April 3d: The patient is inclined to coma; passes his fæces involuntarily; the pulse is dicrotous and very weak, 125 per minute. Treatment continued. Died comatose, April 4th. *Autopsy:* The thoracic viscera presented nothing abnormal. The large intestine, especially about the sigmoid portion, was the seat of ulcers of every shape and size; some of them had penetrated through the muscular coat to the peritoneum.—Acting Assistant Surgeon H. Lowenthal.

The following case was reported on a medical descriptive list from the second division of the Annapolis Hospital, Assistant Surgeon G. B. Parker, U. S. V., in charge:

Case 221.—Private John W. Farrow, Company D, 4th Tennessee volunteers; age 22; admitted from Richmond, Virginia, March 30, 1864. Chronic diarrhœa. This man had been for two or three weeks a prisoner on Belle Isle, and was there attacked with diarrhœa. His alvine discharges were very frequent and watery; he had great thirst and but little appetite; his pulse was 110 and small; there was great tenderness in the whole course of the colon, and violent tenesmus. To take camphor and opium pills; milk and beef-tea. April 1st: Substitute five drops of nitric acid three times daily. April 4th: Use enemata of sulphate of zinc and laudanum in starch-water, with half a grain of morphia at bed-time. April 9th: Up to this date there has been but little abatement of his symptoms. He has complained of tenesmus and pain in the bowels, with frequent stools, which, however, contained no true fæcal matter. Substitute pills of nitrate of silver for the former treatment. Continue the morphia at bed-time. April 13th: To take half an ounce of castor oil and five drops of spirits of turpentine at a dose, and repeat in three hours; this to be followed by lead and opium pills. Died, April 17th. *Autopsy* fourteen hours after death: Extensive peritoneal adhesions bound the viscera to the abdominal walls, but there was no effusion of fluid into the peritoneal sac. The whole intestinal tube was in an almost gangrenous condition. The colon was extensively ulcerated, the ulceration extending into the rectum.—Acting Assistant Surgeon B. F. Berkley.

The next four cases were reported on medical descriptive lists from the Annapolis Junction Hospital, Maryland, Assistant Surgeon Cyrus Bacon, Jr., U. S. A., in charge:

Case 222.—Private D. C. Stinecypher, company B, 2d East Tennessee mounted infantry; age 24; admitted June 7, 1864. Chronic diarrhœa and scurvy. This man was captured at Rogersville, Tennessee, November 6, 1863. He was

confined at Belle Isle, Virginia, seven months; was in hospital while there some six weeks. April 29, 1864, he was paroled, and arrived at Annapolis, Maryland, May 2d. [The register of the first division, Annapolis hospital, reports him admitted May 2d—consumption—transferred to Annapolis Junction June 7th.] When first seen by the reporter, June 21st, he had, besides his diarrhœa, evident effusion into the chest, pericardium, and abdominal cavity. The act of respiration was exceedingly laborious, and he could only lie on his right side, breathing even then with great difficulty. His face, left arm, and hand were greatly swollen, but he could use the arm freely; his appetite was craving. Ordered a combination of cream of tartar and squill as a diuretic, together with the free use of lemonade, good diet, and milk-punch. June 26th: The effusion is decreasing; there is less dyspnœa, but the pulse is small and very rapid, and the action of the heart irregular. June 27th: He complains of pain on pressure over the lumbar region, and is growing sensibly weaker; his appetite is decreasing. Stop the bitartrate of potassa and squill, which seem to act as a cathartic; continue the lemonade and milk-punch. June 29th: Breathes with great difficulty; has now very little diarrhœa. After this date the patient grew steadily worse; his face became more puffy; he lay on his right side until he became so feeble as to lie only on his back, and died July 12th. *Autopsy* eight hours after death: The right lung was strongly adherent to the thoracic parietes, and pushed into the upper part of the chest by a quantity of dirty yellow serum. There was some similar fluid in the left pleural sac, and the peritoneum contained several ounces of the same. The liver was normal. The spleen was greatly enlarged but quite firm. The small intestine was thin and distended with gas; the solitary follicles were enlarged to the size of pin-heads. The colon also was very thin, and its solitary follicles were enlarged. The rectum was thickened and contracted.—Assistant Surgeon C. Bacon, jr., U. S. A. [No. 328, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the ileum, including the ileo-cæcal valve and a small part of the cæcum. The solitary follicles are slightly enlarged.]

CASE 223.—Private Pleasant Trent, company C, 10th Tennessee cavalry; age 34; admitted from Annapolis, Maryland, June 7, 1864. Diarrhœa and scurvy. [This man appears on the register of the first division of the Annapolis hospital as admitted May 2d—debility—transferred to Annapolis Junction June 7th.] The patient had been for a long time a prisoner at Richmond, Virginia, and was very much reduced. July 17th: It was observed that he was suffering from fever; pulse strong and frequent, skin hot and dry, tongue thickly coated with a white fur, bowels constipated, respiration frequent, headache, and loss of appetite. Ordered a laxative dose of sulphate of magnesia, and continued the lime-juice and porter which he was taking. July 18th: Bowels have moved; has less fever; slept but little last night; is quite restless. Quinine, beef-tea, porter, and lime-juice. July 19th: Is quite restless and uneasy; has some delirium; slept none last night; pulse 60 and full; tongue thickly coated. July 20th: Still delirious; pulse 60 and easily compressed; constantly picking at objects about the bed. Brandy, milk, and beef-tea given freely; mustard plasters to the abdomen and between the shoulders. July 21st: Is unconscious; sleeps none; lies more quietly, with his mouth open; tongue dry; pulse 64; pupils dilated and unaffected by light; extremities cold; involuntary passages of urine. July 22d: Passed the night without sleep; pupils still dilated but not so widely; pulse 70 and smaller; still has involuntary passages of urine, and is much troubled with hiccough. Brandy, beef-tea, milk, and carbonate of ammonia. July 23d: Lies very quietly; is unconscious; slept none last night; pulse 80 and wiry; hiccough continues. Treatment continued. July 24th: Still unconscious; pulse 120; respiration frequent. Died, July 25th. Since July 17th he has had no cough, no tympanites, and no diarrhœa. *Autopsy* twelve hours after death: Body very much emaciated. The membranes and surface of the brain were normal, but on separating the hemispheres the roof of the ventricles gave way, and about four ounces of liquid escaped; the floor and roof of the ventricles were soft and pultaceous. There were firm pleuritic adhesions laterally and posteriorly on the right side, and tubercular deposits were scattered throughout the right lung, most abundantly at its apex; the left lung was very slightly adherent to the walls of the chest; the pulmonary tissue was of a dark color, and its upper portion was completely filled with tubercular matter, which gradually became more scanty toward the base. The heart was slightly enlarged, and the sac of the pericardium contained about half an ounce of liquid; the cavities of the heart contained firm fibrinous clots. The liver, spleen, kidneys, stomach, and bladder were apparently healthy. On the external surface of the small intestine a few dark-colored patches were observed, which proved, on opening the intestine, to correspond to areas of inflammation and thickening of the mucous membrane. The solitary follicles of the ileum were slightly enlarged, and the colon presented great numbers of superficial ulcers, which varied in size from mere points to nearly an inch in diameter.—Acting Assistant Surgeon W. J. McIlench.

CASE 224.—Private H. Behlmer, company C, 165th New York volunteers; age 19; admitted from the barracks at the Relay House, Maryland, August 17, 1864. Chronic diarrhœa. [This man appears on the register of the hospital of the Relay House barracks, Washington junction of the Baltimore and Ohio railroad, as admitted August 13th—chronic diarrhœa—sent to hospital August 17th.] The patient stated that he had suffered from diarrhœa for a month. He was very much emaciated, and unable to walk. The evacuations were very frequent, but there was no pain; tongue dry, smooth, and red; pulse 70; no appetite; much thirst. Treatment: ℞. Compound tincture of opium and tincture of catechu, of each two ounces, tincture of rhubarb one ounce. Take a teaspoonful every four hours. August 18th: Evacuations less frequent; slept very well during the night; complains of extreme weakness; pulse 60. Treatment continued, with whiskey and quinine. Milk diet, soft-boiled eggs. August 19th: Appears better; evacuations less frequent; is still very weak; pulse 60. Continue treatment, with the addition of five grains of subcarbonate of bismuth every two hours. August 23d: Is delirious; pulse 70; evacuations very frequent. Died, August 24th. *Autopsy* twenty-one hours after death: Body very much emaciated. The lungs were normal, but bound to the thoracic parietes by adhesions which were easily broken down. The heart contained large clots. The liver was normal; the gall-bladder was full of bile, and contained some twenty or more gall-stones from the size of a small shot to half an inch in diameter. The stomach was not examined. The intestines had a healthy appearance, except about three feet of the lower portion of the ileum, which were inflamed but not ulcerated.—Acting Assistant Surgeons W. J. McIlench and Horace S. Streeter.

CASE 225.—Private John Weiss, company E, 5th New York heavy artillery; age 41; admitted from Camp Parole, Maryland, October 12, 1864. Chronic diarrhœa. [This man appears on the register of the post hospital, Camp Hill, Harper's Ferry,

Virginia, as admitted July 24, 1864—debility—sent to Sandy Hook, Maryland, July 25th. He is borne on the register of the field hospital, Sandy Hook, Maryland, as admitted July 25th—catarrh—transferred to Frederick, Maryland, July 27th. The register of the Frederick hospital records him admitted July 27th—chronic diarrhœa—sent to Baltimore, Maryland, August 1st. He appears on the register of McKim's Mansion hospital, Baltimore, as admitted August 2d—no diagnosis—sent to Annapolis, Maryland, August 3d. The register of the hospital of Camp Parole, Annapolis, Maryland, reports him admitted August 3d—chronic diarrhœa—sent to general hospital October 12th.] The patient stated that he had suffered from diarrhœa for over six months. He was very much emaciated; tongue coated with a dry brownish fur in the centre, and red and dry at the tip and edges; appetite poor; constant thirst; skin dry and cool; pulse 60 and weak; bowels moved three or four times daily; countenance pinched. Treatment: R. Sulphate of copper twelve grains, opium ten grains, extract of conium two scruples; make thirty pills. Take one every eight hours; also enemata of laudanum and sulphate of copper in starch-water. He was put on a milk diet. Red wine was allowed liberally; also beef-essence and chicken-broth when he could retain them. After a couple of days he was allowed milk-punch. The patient steadily grew feebler; the pulse became weaker and slower, the last eight days of life it was from 40 to 46 per minute; the cornea of both eyes ulcerated about a week before death, and for the last three days he was semi-delirious. Died, November 10th. *Autopsy:* Body extremely emaciated. The lungs were very dark-colored, and there were a few large tubercles in the upper lobe of the left lung. The heart was normal. The stomach was diminished in size. The duodenum, jejunum, and upper two-thirds of the ileum were but slightly inflamed; the lower third of the ileum, the cæcum, colon, and rectum were thickened and softened. The patches of Peyer were slightly inflamed but not ulcerated; the solitary follicles were slightly enlarged but not ulcerated; a few small points of ulceration were observed in the rectum. The kidneys were somewhat enlarged and very pale. The spleen was enlarged and soft. The pancreas and liver were normal.—Acting Assistant Surgeon Horace S. Streeter.

The next eleven cases were forwarded on medical descriptive lists from the HAMMOND HOSPITAL, Point Lookout, Maryland, Surgeon Anthony Heger, U. S. A., in charge. All the patients were prisoners of war:

CASE 226.—Private William Hipps, company G, 61st Georgia; age 44; admitted August 14, 1863. Diarrhœa. Was taken sick three days before; pulse quite natural. To have a dose of castor oil. After the operation of the oil, the stools continuing to be frequent, twenty drops of laudanum were given three times a day for a few days. The diarrhœa, however, persisted, and various remedies were vainly tried, as subnitrate of bismuth ten grains three times a day, tannic acid and opium, tincture of the chloride of iron, quinine, stimulants, &c. Died, October 24th. *Autopsy* thirty-six hours after death: Body excessively emaciated. Nearly the whole of the left lung was in a state of gray hepatization, and coated with lymph externally; the right lung was congested. The sac of the pericardium contained nearly a pint of serum, and the surface of the heart was coated with fibrinous lymph; the valves were normal; the right cavities contained fibrinous clots; the heart weighed six ounces. The liver was softened, mottled, and fatty, with three peculiar white, hard, spherical bodies on its under surface; it weighed three pounds four ounces. The right kidney was normal but small, weighing three ounces and a half; the left was larger, weighing four ounces and a half. The spleen weighed only three ounces. The stomach was normal, but its coats were very thin. The ileum was congested, and in its lower part a few of the glands of Peyer were ulcerated. The mucous membrane of the rectum and colon was of a peculiar ash-gray color, and had large ulcers throughout its entire extent.—Acting Assistant Surgeon W. W. Bidlack.

CASE 227.—Private B. A. Shaw, company L, 31st South Carolina; admitted October 26, 1863. Chronic diarrhœa. This patient stated that he was taken sick at Morris Island, South Carolina, May 20th. At the date of admission he was very weak and had an exhausting diarrhœa. To take twenty drops of laudanum after each passage. Stimulants; milk diet. Died, November 2d. *Autopsy* twenty-four hours after death: Body much emaciated. The upper lobe of the right lung was adherent by fibrous bands to the thoracic parietes; immediately under the adhesion there was a cavity as large as a hen's egg, filled with dark pus; this cavity had a membranous lining; the lung was hepatized for some extent around it; there were no tubercles; the left lung was normal. The cavity of the pericardium was nearly filled with serum. The heart was well coated with fat; there was a fibrinous clot in the left ventricle; otherwise it was normal. The liver was normal in size, but paler than natural. The spleen was adherent to the diaphragm and enlarged. The kidneys were congested. The mucous membrane of the colon was inflamed, and in patches coated with pseudomembrane; it presented numerous small punched-out follicular ulcers.—Acting Assistant Surgeon W. W. Bidlack. [No. 78, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the transverse colon, with numerous small punched-out follicular ulcers and small pseudomembranous patches scattered over the mucous membrane.]

CASE 228.—Private D. F. Taylor, company A, 20th Arkansas; admitted November 7, 1863. Chronic diarrhœa. The patient stated that he was taken sick in July last; he was very weak. Ordered stimulants and opium pills. November 18th: The diarrhœa has diminished; during the day the patient had a chill. The stimulants were continued, and mustard plasters applied to the extremities. November 19th: Had another chill. Treatment continued. November 20th: He had another chill, during which he died. These chills partook rather of the nature of spasms; during the intervals the patient was able to sit up. *Autopsy* the same day: Body somewhat emaciated. The lungs were normal. The pericardium was distended with serum; there was a large fibrinous clot in the left ventricle, but the heart was otherwise normal; weighed eleven ounces. The liver was softened and enlarged; it weighed four pounds ten ounces. The spleen weighed thirteen ounces. The kidneys were normal. The small intestine was inflamed throughout. The colon was inflamed and ulcerated in patches.—Acting Assistant Surgeon W. W. Bidlack.

CASE 229.—Private T. L. Langford, company D, 55th North Carolina; admitted November 23, 1863. Chronic diarrhœa and scurvy. The patient was extremely emaciated; his gums bleeding; he had daily eight to ten stools, which were somewhat

bloody and mixed with pus; he had also some cough, but no pain in the chest and no night-sweats; the sputa, however, were purulent, and percussion was duller than normal over the whole chest. Treatment: Opium pills, two ounces of whiskey daily. Diet: Bread and milk, chicken-soup, eggs. Died, December 17th. *Autopsy:* The pleuræ were normal, but there was lobular inflammation of both lungs, the patches being of limited extent and of gray-red color; they were not softened, though not so solid as in red hepatization. The heart and liver were normal. There were a great number of ulcers and a great deal of ecchymosis in the transverse colon.—Acting Assistant Surgeon Francis P. Geisdorff.

CASE 230.—Private Robert Moore, company F, 61st Tennessee; admitted November 23, 1863. Chronic diarrhœa. This man had been sick for seven months with diarrhœa and cough. When admitted he complained of pain in the left side of the chest, which was dull on percussion above the third rib. A crepitant rale was heard over the same region, and moist rales over the rest of both lungs. The expectoration was purulent; skin hot; pulse 110. He was much emaciated, and had eight to ten passages daily. Treatment: A grain of opium twice daily; tincture of catechu; whiskey. Diet: Milk and chicken. Died, December 22d. *Autopsy:* The upper lobe of the left lung was hepatized red throughout; in the lower lobe of this lung, and throughout the right lung, the bronchial passages were inflamed. The heart was large. The liver was pale and presented the nutmeg appearance. The mucous membrane of the jejunum was thickened and the larger vessels were much congested. The mucous membrane of the transverse colon and cæcum was very much thickened, red, and inflamed, but no ulcers were found. The cortical substance of the kidneys was very pale.—Acting Assistant Surgeon Francis P. Geisdorff.

CASE 231.—Sergeant T. B. Pett, company B, 44th North Carolina; age 38; admitted November 23, 1863. Chronic diarrhœa. The patient was very much emaciated, and had from six to eight passages daily; these contained some pus but no blood; his abdomen was much contracted, but he was able to walk, and his appetite was good; he continued in this condition until the middle of December. The treatment consisted in the use of opium and camphor pills and stimulants; bread and milk, chicken, eggs, &c., for diet. December 26th: The diarrhœa has increased since the last cold spell of weather; there is also some cough and pain in the chest. To take a tablespoonful of whiskey every two hours. Died, December 28th. *Autopsy:* The posterior portions of both lungs were in the first stage of inflammation, with small limited regions of the same character scattered throughout other portions of both lungs. The intestines were diseased in their whole course. There were some cicatrices in the small intestine, but no ulcers. The colon was ulcerated. The stomach was considerably contracted, its lumen being smaller than that of the transverse colon. Acting Assistant Surgeon Francis P. Geisdorff.

CASE 232.—Private A. T. Brogdon, company E, 47th North Carolina; age 37; admitted November 23, 1863. Chronic diarrhœa and scurvy. This patient had diarrhœa and scurvy for the last six months. At first the muscles of the calves of his legs were affected; for the last four weeks the gums had been bleeding; the teeth were perfectly black; he had lost flesh considerably, but his appetite most of the time was good. He had from four to seven loose stools in the twenty-four hours; they were thin, yellow, and contained at times a little blood. Treatment: One to two grains of opium daily; turpentine emulsion; whiskey. Diet: Bread and milk, chicken, &c. During the month of December the diarrhœa temporarily improved, but the patient gradually continued to lose flesh, and after the first of January, 1864, he became more prostrated; a slight cough set in, with some pain in the chest, sore throat, and difficulty in swallowing. Died, January 7th. *Autopsy* thirty hours after death: The right lung was normal; the left lung contained many softened tubercles, and appeared to be in the first stage of pneumonia. The stomach and intestines were much contracted. The mucous membrane of the cæcum and transverse colon was thickened and of a gray color. A few slight abrasions were found, but no ulcers.—Acting Assistant Surgeon Francis P. Geisdorff.

CASE 233.—Private Jacob Ury, company H, 57th North Carolina; admitted from camp December 23, 1863. Chronic diarrhœa. [This man is borne on the register of the Prison Camp, Point Lookout, as admitted December 11th—dysentery—sent to general hospital December 22d.] The patient stated that he had been sick two months. He had eight or nine stools daily, with but little pain. His tongue was red but moist, and he complained much of thirst. To take tincture of the chloride of iron; chicken and thickened milk. December 26th: Had five stools during the last twenty-four hours. December 28th: Transferred to ward 13.—Acting Assistant Surgeon Geo. Johnson. Ward 13. December 28th: Ordered tincture of ginger, opium, and a cough mixture; nourishing diet. January 5, 1864: Seems to be improving slowly. Continued treatment, with a pill of camphor and opium at bed-time. January 6th: Had but three evacuations in the last twenty-four hours. Treatment continued. January 9th: Abdomen very painful and tender; has considerable fever. Applied a mustard poultice to the abdomen. Died, January 10th. *Autopsy:* Evidences of peritonitis were found, and the mucous membrane of the colon was thickened and ulcerated, especially in its lower portion, where the calibre of the gut was considerably diminished. Acting Assistant Surgeon M. A. Booth.

CASE 234.—Private Thomas D. Hare, company A, 1st South Carolina; age 35; admitted November 23, 1863. Chronic diarrhœa and scurvy. This patient stated that he had typhoid fever three months ago, and has had some diarrhœa ever since; he has bleeding gums; is very weak, and somewhat emaciated. To take ten drops of tincture of the chloride of iron three times daily; extra diet. This, however, did not check the diarrhœa, which continued to average from five to ten passages daily. December 30th: Turpentine emulsion was prescribed, with one or two grains of opium in the twenty-four hours; stimulants. Died, January 11, 1864. *Autopsy:* The mucous membrane of the intestine was softened, red, and in the large intestine presented small ulcers, which were most numerous in the cæcum.—Acting Assistant Surgeon Francis P. Geisdorff.

CASE 235.—Private Alexander Stowe, company E, 11th North Carolina; age 28; admitted from the prisoner's camp, October 26, 1863. Chronic diarrhœa. This man had had diarrhœa for some time; his passages were numerous, bloody, and attended with tenesmus, and he presented evidences of a scorbutic condition. Treatment: Pills of tannic acid and opium; Dover's powder at bed-time; whiskey, &c.; special diet. Under this treatment he improved somewhat until December 1st, when he had a relapse; the stools again became very frequent, and he complained of abdominal pain. He again improved under the same treatment until January 5, 1864, when rheumatism appeared in the muscles of his upper and lower extremities; there

was pain on moving the limbs, and much general debility. Treatment: Iodide of potassium, blisters to the calves of the legs, &c. January 25th: The pain in the limbs is much better, but the patient remains weak and the diarrhœa continues. To take sulphate of quinia, turpentine emulsion, and a Dover's powder at bed-time. January 28th: He got out of his bed, and, while walking about the ward, fell, was carried back to bed and found to be dead. *Autopsy* about twenty-four hours after death: Nothing was found in the organs to explain the cause of death. There was general venous congestion of the body; the blood was dark, and not coagulated in the heart. The brain was normal, with the exception of venous congestion of the membranes. The heart was normal. [The condition of the intestinal mucous membrane is not recorded.]—Assistant Surgeon George McC. Miller, U. S. V.

Case 236.—Private J. W. McCoy, company A, 3d Tennessee; age 20; admitted November 19, 1863. Chronic diarrhœa. This patient stated that he was taken sick at Fort Delaware, October 17th; could give no particulars of his illness except that he had and still has diarrhœa. Treatment: Pills of nitrate of silver and opium, cod-liver oil, stimulants; extra diet. January 10, 1864: The diarrhœa continues; bowels very loose. Substitute camphor and opium pills. January 15th: Has now but four stools daily. January 18th: Complains of pain in the abdomen; is very weak. Stimulants. January 24th: The diarrhœa has recurred; he still complains of pain in the stomach. February 3d: Stools again reduced in number to four or five daily. February 5th: Dysenteric symptoms have supervened, with anorexia. Substitute Hope's camphor mixture. February 9th: The dysenteric symptoms have subsided. Substitute Fowler's solution, with tincture of opium and cinnamon water. February 14th: Stools diminished in frequency to two or three daily. February 19th: Stools frequent once more. February 23th: Better again; has but two or three stools daily; appetite improving. March 2d: Is troubled with a catarrhal cough. To use a cough mixture containing wine of antimony, syrup of squill and laudanum. March 12th: The cough is relieved, but the diarrhœa has increased; has tenesmus and some blood in the stools. Renew prescription of February 9th. March 16th: Stools are still frequent but not painful, and no blood. Treatment continued. March 17th: Substitute pills of acetate of lead and opium. March 25th: The patient again has a severe cough; on examination of the chest, a good deal of mucous rattling can be heard on both sides; the expectoration is yellowish-white. To take chalk mixture and catechu; a Dover's powder at night. April 5th: The diarrhœa is somewhat better, but the cough is troublesome; there are evidences of pleuritic effusion on the right side. To take five grains of iodide of potassium, in solution, every four hours. April 12th: Diarrhœa worse again. Pills of nitrate of silver and opium, quarter of a grain each, to be taken four times a day. Died, May 5th. *Autopsy:* A great quantity of turbid serum was found in both pleural sacs and in the pericardium; there were old pleuritic adhesions on both sides, especially the right; crude tubercles were scattered through both lungs; some of them had calcified. The right side of the heart contained a yellowish fibrinous clot. The liver was small; the spleen very soft. A number of very large ulcers, some of them as large as a twenty-five cent piece, with callous thick borders, were observed in the small intestine. The colon was slate-colored, and presented a number of ulcers, which, however, were much smaller than those in the small intestine. The mesenteric glands were greatly enlarged. In the left kidney there was a cavity which contained a dirty yellowish chalky deposit.—Acting Assistant Surgeon W. W. Bidlack.

## The next four cases are from the case-book of the Frederick Hospital, Maryland, Assistant Surgeon Robert F. Weir, U. S. A., in charge.

Case 237.—Captain J. M. Mott, company K, 5th Wisconsin volunteers; age 45; admitted July 18, 1863. Colic. The patient stated that he had suffered from diarrhœa for some time past, but that it had not been troublesome. The remedies prescribed relieved the pain, and on the evening of the third day he considered himself able to sit up, but was forbidden by his attending surgeon. The patient's pulse was not at any time accelerated, nor was there any heat of skin, tympanites, or tenderness on pressure over any portion of the abdomen. July 23d: The patient was allowed to sit up at noon, and sat up all the afternoon, expressing himself as feeling perfectly well. He ate a hearty supper at 5 P. M., and about an hour after was attacked with a violent pain in the bowels, and died at 8 P. M. *Autopsy* fourteen hours after death: Thoracic viscera healthy; there were evidences of recent peritonitis throughout the entire abdominal cavity, which contained about three pints of turbid serum of a decidedly fecal odor. On examining the ileum, ulceration of the solitary glands was found throughout its entire extent; two of these ulcers had perforated; there was also ulceration of the large intestine.—Surgeon Charles E. Swasey, U. S. V.

Case 238.—Private James Harvey, company K, 26th Massachusetts volunteers; admitted September 14, 1864. Acute dysentery. The patient when admitted had bloody dejections every five minutes, and complained of severe pain in the region of the bladder; he was unable to pass his urine; it was drawn off by the catheter, and lead and opium pills were ordered. September 15th: Continued pills, and ordered injections of acetate of lead and laudanum; applied a mustard poultice to the hypogastric region; beef-tea and farinaceous diet. He died during the night of the 15th. *Autopsy* ten hours after death: There was slight peritoneal inflammation; the mucous membrane of the colon was much inflamed, and in the ascending and transverse colon there was some ulceration; the coats of the colon were thickened; the mucous membrane of the rectum was highly injected.—Acting Assistant Surgeon Richard W. Mansfield.

Case 239.—Private Alexander Smith, company I, 1st Vermont heavy artillery; age 39; admitted October 12, 1864. Dysentery. This patient was admitted as a convalescent from chronic diarrhœa. His bowels were still moved about twice a day, but the passages were nearly healthy; there was very little pain in the bowels. No medicines were prescribed; light diet. October 14th: Is still improving, able to be about and out of his tent; volunteered to assist in nursing, and was permitted to do so. October 16th: Symptoms of acute dysentery have made their appearance; there are frequent bloody discharges, accompanied by tenesmus and pain in the bowels; the skin is hot; pulse rapid; tongue dry and brown. To take three times daily a pill containing a grain of opium and two of acetate of lead; also an ounce of brandy with the alcohol partially burnt off, four times a day. October 17th: Symptoms the same. To take two grains of opium three times a day; the burnt brandy continued.

October 18th: The stools are still more frequent and the abdominal pains more severe. To take a grain of opium after each stool, and a laudanum injection three times daily. October 19th: The stools are less frequent and not so bloody. Continue treatment. October 20th: The patient continues more comfortable. A grain of opium every four hours; continue the brandy and injections. October 21st: The stools have again increased in frequency; the abdominal pain has recurred; injections not retained. Ordered hot fomentations to the abdomen; brandy increased to eight ounces during the day; a grain of opium in suppository every four hours. Died, October 23d. *Autopsy:* The mucous membrane of the rectum and colon was extensively ulcerated; the mucous membrane of the ileum was injected and softened, but not ulcerated.—Acting Assistant Surgeon T. O. Cornish. [No. 835, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon, with extensive and deep diphtheritic ulcers.]

CASE 240.—Private Marion Ardrey, company D, 24th Iowa volunteers; age 18; admitted January 2, 1865. Chronic diarrhœa. [This man appears on the register of the depot field hospital, Winchester, Virginia, as admitted from his regiment January 1st—diarrhœa—sent to general hospital January 2d.] Was first seen by the reporter January 18th; he was then much emaciated, but his appetite was fair, and he appeared to digest his food pretty well. He complains of slight diarrhœa, and has two or three evacuations daily; these are frequently large and thin, but not attended with pain. The abdomen is flat, and there is no tenderness on pressure. Ordered three grains of sulphate of quinia and a wineglassful of infusion of calumbo three times a day; opium and astringents for the diarrhœa. January 22d: Condition about the same, the diarrhœa perhaps somewhat better; the patient is walking around the barrack, but complains of slight difficulty in using his lower extremities. January 24th: The diarrhœa is still improving, but the patient has still less control of his lower limbs, and is scarcely able to stand. He was advised to go to bed. At half-past nine in the evening he complained of intense pain in the abdomen, for which a dose of morphia was administered. He died next morning, January 25th, at 7.30. *Autopsy* four hours after death: Body much emaciated. The brain was not examined. The mucous membrane of the bronchial tubes was inflamed and thickened, but both lungs were crepitant throughout. The pericardium contained an ounce of limpid serum. The heart was quite small. The liver was normal; the gall-bladder much distended with thin light-colored bile. The spleen was congested. The kidneys were large but healthy. In the ileum Peyer's patches were extensively diseased, and many of them were in an advanced state of ulceration; the solitary glands were also ulcerated. The mucous membrane of the transverse and descending colon was much inflamed, and ulcerated at numerous points.—Acting Assistant Surgeon Wm. S. Adams.

## The next twenty cases are from the case-book of the CUMBERLAND HOSPITAL, Maryland, Surgeon John B. Lewis, U. S. V., in charge:

CASE 241.—Private William Cook, company K, 156th Ohio national guards; age 32; admitted August 5, 1864. Acute diarrhœa. The patient stated that he had been sick over two weeks; often had ten or fifteen stools a day; was a stout, healthy man when he enlisted. He was very much emaciated, and had to be carried from the ambulance on a litter; the condition of his circulation, however, was good; the abdomen was slightly tympanitic and painful on pressure. Directed emulsion of turpentine containing laudanum every three hours. August 6th: The patient rested tolerably well last night; pulse 95; tongue moist and cleaning; appetite tolerably good. August 7th: Slept well last night; pulse 92; evacuations less frequent; bowels still slightly tympanitic; appetite tolerable. August 8th: There has been no movement of the bowels since yesterday; abdomen very tympanitic; respirations 36. Ordered injections of salt water, followed by injections of castor oil. August 9th: Bowels not yet moved; pulse 130 and almost imperceptible; patient complains of great distress in præcordial region; the abdomen is enormously distended; everything swallowed regurgitates from the stomach. Ordered a drachm of calcined magnesia; the injections to be repeated. Died, August 10th. *Autopsy* three hours after death: Extreme rigor mortis; froth escaping from the nostrils. There were extensive pleuritic adhesions on both sides. The peritoneal cavity contained a small quantity of pus. The stomach and intestines were so greatly distended with flatus that the diaphragm was pushed up to the level of the fourth rib. The intestinal mucous membrane was more or less inflamed from the pyloric orifice to the rectum. The liver and spleen were considerably enlarged.—Assistant Surgeon David Shanor, 6th West Virginia volunteers.

CASE 242.—Private John Wimer, company M, 3d Virginia cavalry; age 21; admitted August 19, 1864. Chronic diarrhœa. The patient stated that he enlisted about six months ago. His health previously had been good, and continued so until his present illness. Previous to his arrival here he had been five days in hospital at New Creek, Virginia, and one day and night in Cumberland. It is noteworthy in this connection that nearly all the cases sent from New Creek have presented malignant typhoid symptoms. August 20th: Tongue coated with a whitish-brown fur; pulse rapid and wiry; skin harsh, dry, and cool; countenance flushed and anxious; abdomen tender on pressure, particularly in the iliac region; frequent dark liquid stools. R. Tincture of camphor, tincture of opium, tincture of rhubarb, tincture of capsicum, essence of peppermint and fluid extract of ginger, equal parts. To take forty drops in whiskey every four hours. Also R. Tannin one drachm, powdered ipecacuanha five grains, powdered opium eight grains, powdered camphor six grains; make six powders. Take one every four hours between the doses of the former medicine. Apply a mustard plaster to the abdomen. Under this treatment the diarrhœa was checked and the patient seemed to improve considerably for a few days, after which he grew worse again. August 29th: Pulse 100 and irritable; tongue brown and dry; cheeks darkly flushed; skin hot and dry; abdomen tender and tympanitic; bowels constipated; delirium and jactitation. Ordered half an ounce of castor oil, with ten drops of oil of turpentine; after operating, to take quinine three times daily and ten drops of spirits of turpentine every two hours; a dose of morphia at bed-time. Whiskey-punch and milk diet. August 30th: Rested well last night. The cathartic has operated well; the abdomen is soft and less painful, but still sensitive to pressure; pulse 88 and full; countenance darkly flushed; tongue moist and red. Continue treatment. September 3d: Pulse 85; tongue dry and glazed; abdomen very painful on pressure; diarrhœa has again set in; the stools are frequent, thin, fetid, and muco-purulent, and are accompanied by tormina and tenesmus; there is no delirium. Continue treatment, but substitute a Dover's powder for the morphia at bed-time. September 10th: Has been

improving since last report, but the diarrhœa still continues. September 21st: Worse again; symptoms about as recorded on the 3d, with the addition of delirium and subsultus tendinum. After this, with occasional periods of improvement, followed by recurrence of all the symptoms, the case progressed steadily to a fatal termination. The later stages were characterized by sordes on the teeth; a dry, red, glazed tongue, with blackish stripe in the centre; harsh, dry, but cool skin; anxious countenance; great emaciation; petechial discoloration on the abdomen; and small, slimy, frequent stools, which were tinged with blood and mingled with pus. Tonics and stimulants were persisted in to the last. Died comatose, October 9th. *Autopsy* next day: Body greatly emaciated; abdomen sunken. The brain and the thoracic viscera were not examined. The jejunum and upper part of the ileum were comparatively healthy. The lower part of the ileum and the colon presented patches of inflammation, with ulcers and gangrenous spots. The colon was also considerably thickened. The omentum and mesentery were congested. The kidneys were enlarged. The liver enlarged and fatty. The spleen dark and congested.—Acting Assistant Surgeon Austin W. Holden.

Case 213.—Private Patrick Murphy, company A, 2d Maryland volunteers; age 28; admitted October 12, 1864. Chronic diarrhœa. Nothing was learned of his previous history; had evidently been sick for some time. [This man appears on the register of the hospital of the 2d Division, 9th Corps, as admitted September 16th—malarial fever—sent to hospital September 23d. He is borne on the register of the depot hospital, 9th Corps, City Point, Virginia, as admitted September 22d—remittent fever—sent to hospital September 26th. The register of the Beverly hospital, New Jersey, shows that he was admitted to that hospital September 28th—sent to general hospital October 12th.] October 13th: Patient is very much emaciated and very feeble; pulse rapid and feeble; abdomen tender on pressure; stools frequent, dark, thin, and slimy; tongue red, glazed, and dry; anorexia, with nausea. Rested well last night, having taken an opiate. Directed a hot sponge-bath, followed by turpentine stupes to the abdomen. ℞. Tannin one drachm, powdered ipecacuanha five grains, powdered camphor six grains, powdered opium eight grains; make six powders. Take one every four hours; also a tablespoonful of chalk mixture every four hours alternately with the powders. Whiskey-punch; milk diet. October 15th: Pulse 110 and very feeble; sordes on the teeth; skin cool, dry, and harsh; has from eight to ten dark fetid stools in the twenty-four hours, with severe tenesmus, so that he remains on the vessel straining half an hour at a time. Discontinue the chalk mixture; give quinine instead, and ten drops of oil of turpentine three times a day; solution of morphia at bed-time. The patient grew steadily worse, and died October 18th. He was at no time delirious, and retained his consciousness till the last. *Autopsy* five hours after death: Body greatly emaciated; abdomen sunken. The brain and thoracic organs were not examined. There was a quantity of extravasated fluid, smelling strongly of whiskey, in the cavity of the abdomen. The peritoneum was everywhere highly vascular. The stomach was distended. The lower part of the ileum and colon were inflamed, and presented numerous patches of ulceration and several minute perforations; [does not state whether in ileum or colon.] The colon was especially diseased and greatly thickened. A quantity of scybala was impacted in the cæcum. The spleen was enlarged. The liver dark and congested; the gall-bladder distended with normal bile. The kidneys were normal.—Acting Assistant Surgeon Austin W. Holden.

Case 244.—Private Jacob Tolbert, company B, 10th West Virginia volunteers; age 37; admitted November 9, 1864. Chronic diarrhœa. [This man appears on the register of the Sheridan hospital, Winchester, Virginia, as admitted November 1st—diarrhœa—sent to general hospital November 7th.] The patient was extremely weak and emaciated; bowels very loose; had a slight cough; moderate appetite. Ordered turpentine emulsion and laudanum every two hours; also a cough mixture containing syrup of squill and syrup of ipecacuanha. November 13th: Added quinine, tincture of iron and whiskey; milk diet. November 18th: Pulse 64; complains of dysuria; diarrhœa no better. Continue the tonics and whiskey; substitute for the other medicines a teaspoonful of tincture of catechu every three hours, and pills of extract of nux vomica and morphia three times a day. November 20th: Still worse; is drowsy, and complains of pain in the umbilical region. Substitute subnitrate of bismuth for the catechu. A mustard plaster to the abdomen. Beef-essence and milk-punch. Died, November 23d. *Autopsy* three hours after death: Rigor mortis slight; body extremely emaciated. The cæcum was adherent to the surrounding parts and perforated. About two ounces of liquid fæcal matter were found in the pelvic cavity. The mucous membrane of the colon was extensively mortified. The heart was pale and flabby, its walls thin. The other viscera were normal. The effusion of fæcal matter was supposed to be very recent from the fact that there was no peritoneal inflammation.—Assistant Surgeon David Shanor, 6th West Virginia volunteers.

Case 245.—Private Michael Stringer, company C, 5th New York artillery; age 46; admitted July 10, 1864. Diarrhœa. The patient stated that he enlisted February 10, 1862, at which time he was a stout, healthy man, except that he had a chronic ulcer on the right leg. He remained healthy until the autumn of 1863, when he had an attack of erysipelas. He stated also that he had diarrhœa for two days before admission. He admits that he has been intemperate all his life. First came under the care of the reporter October 27th. At this time he was extremely emaciated and barely able to walk about; had from four to six dejections daily—not constantly, but with intervals of constipation. ℞. Extract of nux vomica nine grains, sulphate of morphia two grains; make twelve pills. Take one three times a day, before meals. Two ounces of whiskey three times a day; milk diet exclusively. November 2d: The dejections have diminished in number to two or three daily. The patient is hopeful; his appetite good. He continued to improve gradually, and apparently gained strength till November 26th, when the dejections became more frequent, and some tenderness of the abdomen was noticed. Prescribed a turpentine mixture containing laudanum; continued the nux vomica pills and whiskey. November 30th: The dejections are again reduced to two a day, but the emaciation is steadily increasing, and there is some œdema in the lower extremities. Continue treatment; add a teaspoonful of sweet spirits of nitre every four hours. December 12th: The diarrhœa is checked, but the œdema of the lower extremities has increased, and there is considerable serous effusion in the abdominal cavity; the breathing is hurried and difficult; the skin dry; the secretion of urine is slightly deficient. Paracentesis abdominis was practiced, and a very large quantity of serum was drawn off. To take three grains of blue mass at noon and at bed-time. Continue the sweet spirits of nitre, the turpentine mixture, and the whiskey. December 14th: Seems considerably better; pulse 64; tongue moist; has some appetite; bowels regular. December 20th: Pulse 84; tongue clean and moist; the abdomen is refilling; there is considerable cough; bowels still regular.

Died, December 23d. *Autopsy* seventeen hours after death: Rigor mortis slight; body extremely emaciated. The right lung was everywhere adherent to the pleura costalis, diaphragm, and pericardium; the left lung was adherent at its apex, and contained some tubercular deposit. The heart was very small and flabby; there was a pearly-white, shining, smooth spot, about an inch in diameter, upon the interventricular groove. The liver was small, hard, and in appearance corresponded to the descriptions of the hob-nail liver; the gall-bladder was very much distended with bile. Both kidneys were congested and very small; there was an ecchymosed spot, half an inch in diameter, on the convex surface of the left one. The mesenteric glands were enlarged, many of them tuberculous. The bladder was contracted, and coated externally with a thick layer of coagulable lymph. The intestines were distended with gas; the great omentum contracted and drawn up close to the colon. All the abdominal viscera were spotted over with coagulable lymph. [The condition of the intestinal mucous membrane is not recorded.] Assistant Surgeon David Shanor, 6th West Virginia volunteers.

CASE 246.—Private Isaac J. Ferrell, company H, 4th West Virginia volunteers; age 23; admitted November 5, 1864. Typhoid fever. The patient was feeble; pulse 100; tongue dry; abdomen tympanitic; diarrhœa. November 6th: Ordered a mixture containing quinine and oil of turpentine, and a chalk mixture, to be taken alternately; an ounce of whiskey every three hours. In the course of a few days the diarrhœa was checked, the tongue became moist, and the appetite improved. The patient seemed to do very well until November 20th, when jaundice set in, and the diarrhœa again became troublesome. A combination of blue mass, opium, and acetate of lead was prescribed. November 26th: There being no improvement, pills of nitrate of silver and opium were substituted, and astringent injections administered. This treatment was continued for several days without checking the diarrhœa. A combination of mercury with chalk and opium was then tried, also without effect. December 17th: A combination of extract of nux vomica, sulphate of copper, and opium was prescribed, and December 21st, a turpentine emulsion containing carbonate of ammonia. Died, December 26th. *Autopsy* twelve hours after death: Body extremely emaciated; skin jaundiced. The thoracic viscera were healthy. The gall-bladder was much distended with bile. The pancreas was indurated and livid. The stomach was healthy, with the exception of slight congestion near the cardiac orifice. The jejunum was dark-colored, congested, and contained a quantity of bilious matter. The ileum presented the same appearance. The large intestine was ulcerated throughout its whole extent.—Acting Assistant Surgeon Sample Ford.

CASE 247.—Private Henry Pierson, company D, 5th Michigan cavalry; age 24; admitted October 29, 1864. Chronic diarrhœa. [It appears from the register of the Lincoln hospital, Washington, D. C., that this man was admitted to that hospital June 16, 1864—chronic diarrhœa—and transferred to another hospital June 27th. He is borne on the register of the Satterlee hospital, Philadelphia, as admitted June 28th—chronic diarrhœa—transferred to Detroit, Michigan, August 2d. He appears on the register of the St. Mary's hospital, Detroit, as admitted August 6th, and sent to duty August 19th. The register of the Cavalry Corps hospital, Winchester, Virginia, shows that he was admitted from the field October 20th—chronic diarrhœa—and sent to another hospital October 28th.] The patient stated that he had suffered from chronic diarrhœa for the last eighteen months. October 30th: He is much emaciated; skin cool, dry, and yellow; tongue red, dry, and fissured; has no appetite; great thirst; pulse 70 and feeble; abdomen tympanitic; had fifteen dejections in the last twenty-four hours. Ordered a turpentine mixture containing nux vomica; also quinine and whiskey. November 3d: Seems better; the tongue is moister; the tympanites has disappeared; the dejections are less frequent. Continue the quinine and whiskey. The patient continued to improve till November 20th, when he procured and ate a large quantity of chestnuts. This produced a relapse; the dejections again became very frequent; the abdomen tender and tympanitic; the tongue dry. Renewed the mixture of turpentine and nux vomica prescribed October 30th. November 25th: The patient has again improved, but his appetite remains poor. November 30th: The diarrhœa has recurred. ℞. Nitrate of silver six grains, powdered opium three grains; make twelve pills. Take one every six hours. Continue the quinine and whiskey; milk diet. December 15th: The patient continues to emaciate and grow feeble; his abdomen is more tender and swollen. Substitute for the nitrate of silver pills the following: ℞. Sulphate of copper two grains, powdered opium four grains; make eight pills. Take one every four hours. The patient continued to grow worse, and died December 30th. *Autopsy* ten hours after death: Body extremely emaciated. There were slight pleuritic adhesions on both sides. The posterior portion of the left lung and the lower lobe of the right were filled with numerous small abscesses. The heart was healthy. The great omentum was contracted, and closely adhered to the transverse colon. The pyloric portion of the stomach was contracted, and there were two ulcers near the pylorus, also one of considerable extent in the greater curvature; several others had existed but were healed. The walls of the stomach were thickened, the rugæ very prominent. The mucous membrane of the small intestine was congested and inflamed in patches. The colon was extensively ulcerated from its arch to the rectum. The ulcers were most numerous in the sigmoid flexure; many were healed, some in process of healing, others still spreading. The liver was congested, bleeding freely on section. The spleen was of normal size, but light-colored and hard. The kidneys were much congested. The mesenteric glands were enlarged, hard, and filled with tubercular deposits. Acting Assistant Surgeon S. B. West.

CASE 248.—Private Thomas Tanner, company I, 15th West Virginia volunteers; age 39; admitted from Sheridan hospital, Winchester, Virginia, November 9, 1864. Chronic diarrhœa. The patient stated that he enlisted in August, 1862. Was a robust, healthy man, and always enjoyed good health. Was taken sick about six weeks ago with diarrhœa. He is of intemperate habits. When admitted he was very much emaciated and quite feeble. November 10th: Pulse 76 and weak; tongue moist; abdomen flat; about six liquid stools a day; skin dry and harsh; appetite moderate. ℞. Extract of nux vomica nine grains, sulphate of morphia three grains; make twelve pills. Take one three times a day; Dover's powder at bed-time; milk diet. December 1st: The diarrhœa has gradually diminished and he has now but one dejection daily. Continue treatment; also an ounce of whiskey three times daily. December 21st. Moderate diarrhœa still continues. Substitute the following: ℞. Subnitrate of bismuth one drachm, sulphate of morphia two grains; make eight powders. Take one every four hours; also quinine and tincture of iron. December 22d: At the solicitation of the patient red wine was substituted for the whiskey. The patient continued comparatively free from diarrhœa, but a cough set in, he gradually sank, and died January 29, 1865. *Autopsy*

fourteen hours after death: There was hepatization of about one-third of the lower lobe of the left lung, which was extensively adherent to the posterior and lateral walls of the chest; the right lung was free from adhesions and healthy. The heart was very small; it weighed five ounces and a quarter. The spleen weighed three ounces. The liver was normal; the gall-bladder much distended with bile. The kidneys were large. The lower portion of the ileum for about fourteen inches above the ileo-cæcal valve was thickened, contracted, and presented spots of ulceration. A considerable portion of the ascending, transverse, and descending colon was likewise very much thickened, and contracted to about half an inch in diameter.—Assistant Surgeon David Shanor, 6th West Virginia volunteers.

CASE 249.—Private John Green, company A, 13th West Virginia volunteers; age 41; admitted January 17, 1865. Chronic dysentery. The patient stated that he had enjoyed good health until he was attacked with acute dysentery while on Hunter's raid in the summer of 1864, and he attributed his illness to the hardships and privations endured on that expedition. He entered hospital at Charlestown, West Virginia, on his return, and after a few weeks' treatment rejoined his regiment and continued to do some duty until a short time before admission to this hospital. He was admitted in a state of great exhaustion, and died February 10th. Treatment: Astringents, anodynes, stimulants, &c. *Autopsy* four hours after death: Body extremely emaciated. The brain and thoracic viscera were not examined. The omentum contained no fat. The liver was somewhat enlarged; the gall-bladder was full of bile. The spleen was very small. The mesenteric glands were enlarged and hard. The kidneys were also hard, and their cortical portion appeared to be inflamed. Patches of inflammation were found in the ileum, and the corresponding peritoneal coat was injected. The whole tract of the large intestine from the cæcum to the anus was a mass of ulceration, not a trace of healthy mucous membrane being recognizable.—Acting Assistant Surgeon M. M. Townsend.

CASE 250.—Private James Finch, company M, 5th Indiana cavalry; age 23; admitted from Martinsburg, Virginia, March 15, 1865. Chronic diarrhœa. [The register of the post hospital, Martinsburg, Virginia, reports this man admitted March 7th—chronic diarrhœa—sent to Cumberland, Maryland, March 14th.] The patient was in the last stage of exhaustion from chronic diarrhœa and starvation. He stated that he was taken prisoner near Macon, Georgia, July 31, 1864, and was confined at various places until paroled in February, 1865. Had been sick a long time; attributed his illness to exposure and starvation. His bowels were moved every half hour, and he was so prostrated that he could scarcely talk intelligibly. Treatment: Stimulants, astringents, and nutritious diet. Died, March 18th. *Autopsy* seventeen hours after death: Body extremely emaciated. The skin was of a dark-brown color, as if it had been exposed to the action of smoke for a long time. There was no trace of adipose tissue, and all the tissues were pale and bloodless. The lower lobe of both lungs was firmly adherent to the diaphragm. The lungs were pale anteriorly, and congested hypostatically posteriorly. The heart was pale and flabby, and the pericardium contained two ounces of serum. The liver was large and pale, but firm; the gall-bladder was distended with bile. The spleen was large and pale. The mesenteric glands large and hard. The omentum was entirely devoid of fat. The ascending and descending colon were contracted and extensively ulcerated; in some places the mucous membrane had a gangrenous appearance.—Acting Assistant Surgeon M. M. Townsend.

CASE 251.—Private George W. Willis, company E, 5th West Virginia volunteers; admitted from Annapolis, Maryland, March 19, 1865. This man re-enlisted December 18, 1863. Had enjoyed good health until he was taken prisoner at Berryville, September 4, 1864. Was taken to Winchester, thence to Richmond, afterward to Danville, then to Saulsbury, and finally, February 25, 1865, to Libby prison, where he remained until March 13th, when he was paroled. He is extremely emaciated; pulse 92 and weak; tongue moist and coated; gums scorbutic; throat inflamed; extremities œdematous; there are large blisters on the ankle-joints which discharge a considerable quantity of serum; has loose stools every half hour; urine scanty and of a deep-red color. Had been fed on cob-and-corn-meal bread while a prisoner. Died, March 21st. *Autopsy* twenty-two hours after death: Rigor mortis moderate; body extremely emaciated; abdomen concave. The lungs were very pale, otherwise normal. The heart pale and soft. The peritoneal cavity contained a quantity of serum. The liver was small, pale, and presented the hob-nail appearance; the gall-bladder was pale and empty. The kidneys were pale and soft. [The condition of the intestinal canal is not recorded.]—Assistant Surgeon David Shanor, 6th West Virginia volunteers.

CASE 252.—Private Jacob Rumple, company C, 53d Indiana volunteers; age 35; admitted from Martinsburg, Virginia, March 15, 1865. Chronic diarrhœa. [It appears from the register of the Martinsburg hospital, Virginia, that he was admitted March 7th, and sent to Cumberland March 14th.] The patient stated that he was taken prisoner near Atlanta, Georgia, July 22, 1864, and held at Andersonville and other points in the rebel states until he was paroled, February 26, 1865. He was in a deplorable condition, and had loose passages every half hour, sometimes involuntarily; he had also incessant cough and great dyspnœa. Died, March 21st. *Autopsy* twenty-two hours after death: Rigor mortis extreme; body much emaciated. The heart was large. The pericardium contained two ounces of serum. The right lung was everywhere bound to the thoracic parietes by old adhesions; the posterior portion of the right lung and the upper lobe of the left were hepatized. The posterior portion of the liver was greatly engorged with blood; the organ was bound to the diaphragm and to the transverse colon by strong adhesions. No ulceration was found in any part of the intestinal mucous membrane.—Acting Assistant Surgeon M. M. Townsend.

CASE 253.—Private Lewis Erskin, company D, 23d Ohio volunteers; age 48; admitted March 13, 1865. Acute diarrhœa. This man enlisted in February, 1864. He stated that he had been suffering with diarrhœa for seven days, and had from ten to fifteen dejections daily, with tormina and slight tenesmus. Was not much emaciated; pulse quick and tense; abdomen flat and painful on slight pressure in the track of the colon; tongue moist; appetite good. Ordered ten grains of calomel, to be followed in six hours by a dose of castor oil; next day small and repeated doses of sulphate of morphia. He gradually improved until March 17th; but a few days after a relapse occurred, he rapidly grew worse, and died March 30th. *Autopsy* twelve hours after death: Rigor mortis extreme. The lower lobe of the right lung was hepatized. The intestines were distended with gas. The omentum was very much wasted. The liver was congested and softened; its convex surface adherent to the diaphragm; its anterior border adherent to the colon. The spleen was small. The stomach contained about four ounces of bile. The colon

was thickened and ulcerated throughout its whole extent. One of the ulcers had perforated, and through the opening a quantity of fecal matter had escaped into the abdominal cavity. The right kidney was congested and adherent to the liver.—Assistant Surgeon David Shanor, 6th West Virginia volunteers.

CASE 254.—Private Lyman Henderson, company B, 1st Michigan engineers; age 20; admitted from Annapolis, Maryland, March 19, 1865. Chronic diarrhœa. The patient stated that he was taken prisoner at Waynesboro', Virginia, February 24, 1865, held at Richmond, Virginia, ten days, and paroled March 13th. He is much reduced by his disease. A chalk mixture containing oil of turpentine and nux vomica was ordered, and laudanum enemata. He seemed to improve for a few days, after which the diarrhœa returned with increased severity. Died, April 4th. *Autopsy* eleven hours after death: Rigor mortis well marked; body extremely emaciated. There were old pleuritic adhesions on the right side. The lower lobe of the right lung was hepatized posteriorly and adhered to the middle lobe, which was also hepatized. The pericardium contained twenty ounces of serum. The heart was soft and flabby. The liver was pale and anæmic; the gall-bladder enormously distended with bile. The spleen was pale. The omentum adherent to the descending colon. The mesenteric glands were indurated. The cæcum was partially adherent to the abdominal parietes. The mucous membrane of the ileum was congested and coated with grumous blood. The mucous coat of the descending colon was inflamed and extensively ulcerated.—Acting Assistant Surgeon E. C. Thomas.

CASE 255.—Private Theophilus Legraux, company E, 30th Massachusetts volunteers; admitted from Harper's Ferry, Virginia, April 7, 1865. Chronic diarrhœa. At the time of admission the patient appeared to be suffering chiefly from severe bronchitis, and the state of his bowels did not attract much attention. A cough mixture was prescribed, and a blister applied to the chest. When first seen by the reporter, April 13th, he was quite feeble; pulse 109; respiration somewhat labored. Ordered an ounce of whiskey every two hours. April 15th: He said he felt quite comfortable, and sat up awhile, but complained a good deal of flatulence, and his abdomen was tympanitic. April 18th: He complained of severe headache; otherwise his condition was unchanged. April 19th: He seemed better in the morning, but had several loose passages. At 9.30 A. M. he rose from his bed for the purpose of going to stool, when he suddenly fell with a groan, and died a few minutes after. *Autopsy* four hours after death: The substance of the cerebrum and cerebellum was very anæmic and quite soft. The membranes of the brain were congested; from four to six ounces of serum were found at the base of the brain and in the ventricles. The trachea and large bronchial tubes were inflamed. The entire left lung and the greater portion of the upper lobe of the right were firmly adherent to the thoracic parietes; the lobes of both lungs were interadherent. The stomach and bowels were so distended with flatus that the liver, which was slightly congested, was pushed up to the level of the third rib. The spleen was enlarged, congested, and easily torn. The mucous membrane of the intestines was extensively disorganized, and, in the right iliac region, the knuckles of the intestine were coated with plastic lymph.—Acting Assistant Surgeon Henry J. Weisel.

CASE 256.—Private William P. Halpin, company G, 192d Ohio volunteers; age 20; admitted from Harper's Ferry, Virginia, April 2, 1865. Chronic diarrhœa. The patient was extremely emaciated and very feeble; skin dry and harsh; tongue dry and thickly coated in the middle, its tip and edges red; no appetite; pulse very quick, small, and frequent; frequent liquid, yellow stools. The patient complained of severe colicky pains after eating, and of muscular pains in the back and lower extremities. April 4th: He had severe muscular spasms, which, however, passed off. His diarrhœa resisted treatment, and he died April 25th. *Autopsy* fifteen hours after death: The mucous membrane of the pharynx and larynx was inflamed, thickened, and ulcerated. The lungs and heart were healthy. The liver was very small, pale, and friable; the gall-bladder was filled with tar-like bile. The spleen was very small, soft, and easily broken down. The mucous membrane of the ileum and colon was thickened, congested, and presented irregular patches of a fungoid appearance, [pseudomembrane?] The mesenteric glands were hard and very much enlarged.—Acting Assistant Surgeon S. B. West.

CASE 257.—Private John Schellhorn, company K, 74th Pennsylvania volunteers; age 30; admitted April 1, 1865. Chronic diarrhœa. The patient stated that he was a native of the Tyrol; enlisted in the United States service in the fall of 1862; had previously enjoyed good health. He was attacked with diarrhœa March 3, 1865, but continued to do duty with his regiment until a few days before admission here. He was not much emaciated; tongue furred and dry; pulse quickened; skin dry; had a loose stool almost every hour; complained of severe pain in the region of the transverse colon. Died, April 30th. *Autopsy* twenty-nine hours after death: Rigor mortis moderate. There were extensive old pleuritic adhesions on both sides. The mucous membrane of the colon was inflamed throughout and had sloughed away in patches.—Assistant Surgeon David Shanor, 6th West Virginia volunteers.

CASE 258.—Private Finley McPherson, company F, 6th Michigan cavalry; age 21; admitted from Harper's Ferry, Virginia, April 14, 1865. Chronic diarrhœa. The patient stated that his health had been excellent before enlisting. He was first taken with diarrhœa while in the swamps of the Chickahominy. He was excessively emaciated, eyes sunken, malar bones prominent; skin cool; tongue dirty and pale; he had ten or fifteen dejections a day. Camphor and opium pills were directed. April 18th: One-thirtieth of a grain of strychnia three or four times a day in fluid extract of ginger was prescribed. Under this treatment he gradually improved, and on the 29th reported that his diarrhœa was completely checked. He was ordered to confine himself to a milk diet, and continue the strychnine at longer intervals. May 2d: The diarrhœa recurred, as he supposed from eating some beef-soup. During the afternoon of May 4th he was attacked with violent and diffused pains in the abdomen, pulse frequent, some delirium. Died, May 5th. *Autopsy* twelve hours after death: Body excessively emaciated. The thoracic viscera were normal. The stomach was enormously distended with gas; its mucous membrane inflamed and ulcerated near the pylorus. The mesenteric glands were enlarged and cheesy. The peritoneum was generally inflamed. The liver was pale. The spleen very small and pale. The mucous membrane of the colon was inflamed and ulcerated.—Acting Assistant Surgeon Henry J. Weisel.

CASE 259.—Private Thomas M. Fuller, company C, 1st Michigan cavalry; age 44; admitted from Harper's Ferry, Virginia, April 6, 1865. Diarrhœa. [The register of the Island hospital, Harper's Ferry, Virginia, shows that this man was

admitted to that hospital February 27th—inflammation of the lungs—and sent to Cumberland April 6th.] This was a very delicate man, of scrofulous diathesis. He stated that he had been sick for four weeks. April 13th: The diarrhœa still continues; the dejections are frequent; the tongue dry and red; appetite poor; thirst; pulse feeble, frequent, and compressible. He complains to-day of dyspnœa, and of pain and soreness in the left side of the chest, which is dull on percussion. Died, May 11th. *Autopsy* seven hours after death: Body extremely emaciated. The left pleural cavity was filled with pus. The left lung was collapsed and only a fourth of its normal size; it formed a firm flesh-like mass adherent to the spine. An abscess had formed between the fourth and fifth ribs, commencing about two inches from the sternum and extending to its left border; it appeared to be making an effort to point externally. The pericardium throughout its whole extent was adherent to the heart. The liver was very small, soft, and flabby. The spleen was pale, large, and very soft. The jejunum, ileum, and ascending colon were inflamed and presented patches of ulceration.—Acting Assistant Surgeon S. B. West.

CASE 260.—Private John Kies, company E, 1st Michigan cavalry; age 30; admitted from Winchester, Virginia, October 29, 1864. Chronic diarrhœa, gunshot fracture of right forearm, and intermittent fever. [The register of the Sheridan hospital, Winchester, Virginia, shows that this man was admitted to that hospital from the field October 20th—gunshot wound—and sent to Cumberland October 28th.] This man was wounded in action at Cedar Creek, Virginia, October 19, 1864, by a musket bullet, which entered the ulnar side of the right forearm and passed through the distal extremity of the radius and ulna, fracturing both bones. The hæmorrhage was very free. His health at the time was not good; he had suffered from diarrhœa for two months, and had had quotidian intermittent fever for six weeks. At the time of admission the wound was inflamed, the hand and arm were swollen, but not very painful. The chills continued to recur at irregular intervals, but were finally checked by the use of quinine. November 14th: The arm and hand were very much swollen, painful, and discharged sanious matter freely. His skin was hot and dry; his tongue coated with a brown fur; the pulse quick and feeble; the diarrhœa very troublesome. The arm was amputated by antero-posterior flaps at the junction of its middle and upper thirds, the patient being under the influence of chloroform. He reacted promptly. November 16th: The diarrhœa is very troublesome. Prescribed a mixture containing catechu and nux vomica. The stump did well, and was completely healed by the first of January, 1865. February 18th: His diarrhœa, which had not troubled him for some time, returned, and a hard dry cough without expectoration set in. Died, May 12th. *Au opsy* twenty hours after death: There were old pleuritic adhesions on the left side. The left lung was thickly studded with tubercles, and there was a large vomica in the apex which extended into the lower lobe; the right lung was infiltrated with sero-purulent matter, and presented some scattered tubercles. The heart was pale and flabby. The liver small and chocolate-colored: its veins empty. The spleen was small, pale, and firm; weight three ounces. The mucous membrane of the colon was inflamed, thickened, and ulcerated in patches.—Acting Assistant Surgeon S. B. West.

## The next seven cases were forwarded, with specimens, to the Army Medical Museum from the JUDICIARY SQUARE HOSPITAL, Washington, D. C., Surgeon Charles Page, U. S. A., in charge until December, 1862; afterward Assistant Surgeon Elias J. Marsh, U. S. A.

CASE 261.—Private Andrew A. Edgarton, 2d company Vermont Independent Sharpshooters; admitted November 18, 1862. Chronic diarrhœa. Died, December 25th. *Autopsy:* Besides extensive ulceration of the colon, both kidneys were full of cysts; when fresh the right weighed twenty-four ounces, the left fourteen ounces. No attention had been drawn during life to the condition of these organs.—Surgeon Jos. S. Hildreth, U. S. V. [Nos. 27 to 29, Medical Section, Army Medical Museum, are from this case. No. 27 is the anterior half, No. 28 the posterior half, of the left kidney. They contain innumerable cysts, which vary from the size of a pin-head to that of a chestnut. No. 29 is the right kidney laid open; it is in the same condition as the left, except that some of the cysts are larger, the largest being the size of an English walnut.]

CASE 262.—Private Richard Poole, company C, 3d New Jersey volunteers; admitted from the army of the Potomac February 15, 1863. Chronic diarrhœa. [It appears from the register of the hospital of the 1st Division, 6th Corps, that this man was admitted to that hospital January 20th—chronic diarrhœa—and sent to Washington February 13th.] The patient was in a dying condition when admitted. Died, February 16th. *Autopsy* twelve hours after death: Body emaciated. The brain and spinal marrow were not examined. The heart and lungs were healthy. The spleen was rather small. The pancreas and kidneys were healthy. The mucous membrane of the colon was softened, thickened, purple in color, and presented a number of follicular ulcers. The mucous membrane of the lower portion of the ileum was thickened and presented a number of small ulcers. The rest of the small intestine and the stomach were healthy. [Nos. 220 and 221, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the thickened colon, presenting numerous follicular ulcers. In No. 220 the mucous membrane between the ulcers is slightly coated with pseudomembrane.]

CASE 263.—Private Charles Fehle, company B, 1st New Jersey volunteers; admitted February 15, 1863, with chronic diarrhœa. [It appears from the register of the hospital of the 1st Division, 6th Corps, that this man was admitted to that hospital January 20th, and sent to Washington February 13th; the diagnosis recorded is typhoid fever.] He had been taken sick in the army of the Potomac. Died, February 16th. *Autopsy* twelve hours after death: Body much emaciated. The brain and spinal marrow were not examined. The left lung was healthy; the right lung was very thin, and compressed against the anterior and upper part of the thorax by about two quarts of moderately thick not offensive pus. The pleura costalis was covered by a thick pseudomembrane. The heart was healthy. The liver and kidneys were also healthy. The spleen was very small. The stomach and small intestine were healthy. The mucous membrane of the descending colon and sigmoid flexure was thickened, softened, and presented numerous follicular ulcers from an eighth to half an inch in diameter.—Assistant Surgeon E. J. Marsh, U. S. A. [Nos. 218 and 219, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the colon, presenting numerous follicular ulcers, some of which, in No. 219, have coalesced into an irregular excavating ulcer of considerable size.]

CASE 264.—Private Alfred Woodrow, company C, 23d New Jersey volunteers; admitted from the army of the Potomac February 16, 1863, in a dying condition. He stated that he had been taken sick early in December with fever, without chills, but accompanied by delirium. Diarrhœa set in during the fever, and continued after it had disappeared. During the last two or three weeks his bowels have been moved eight or ten times a day. He died the day of his admission. [It appears from the register of the hospital of the 1st Division, 6th Corps, that this man was admitted to that hospital January 20th, and sent to Washington February 13th; the diagnosis was typhoid fever.] *Autopsy:* Body much emaciated. The brain and spinal cord were not examined. The lungs were healthy. The heart healthy but rather small. The kidneys were healthy. The spleen healthy, but adherent to the liver. The smaller curvature of the stomach was congested. The mucous membrane of the descending colon and sigmoid flexure was thickened, softened, and presented numerous ulcers an eighth to half an inch in diameter; the mucous membrane of the rest of the colon was thickened, softened, and of a greenish-gray color. The cæcum was very much congested and inflamed. Peyer's glands were thickened, and there were patches of inflammation through the whole length of the small intestine.—Assistant Surgeon E. J. Marsh, U. S. A. [No. 217, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the descending colon, which is considerably thickened, and presents numerous follicular ulcers.]

CASE 265.—Private Daniel Webster, company G, 27th New York volunteers; admitted from the army of the Potomac February 15, 1863. Diarrhœa. [It appears from the register of the hospital of the 1st Division, 6th Corps, that this man was admitted to that hospital January 20th, and sent to Washington February 13th; the diagnosis recorded is chronic dysentery.] He stated that he had suffered more or less from diarrhœa ever since enlistment in May, 1861, suffering always most after marching. About December 1, 1862, he was confined to his bed, and has not been up since. Died, February 17th. *Autopsy* next day: There were pleuritic adhesions on the left side, and the lower lobe of the left lung was hepatized; the right lung was healthy. The liver, stomach, kidneys, suprarenal capsules, and the greater part of the small intestine were healthy. The mucous membrane of the colon was inflamed and thickened throughout its whole extent, with ulcers, especially in the cæcum and sigmoid flexure; pseudomembranous patches covered much of the surface of the mucous membrane between the ulcers.—Assistant Surgeon E. J. Marsh, U. S. A. [No. 222, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon, which is somewhat thickened, frosted with pseudomembrane, and presents a few small follicular ulcers.]

CASE 266.—Private J. G. Beals, company F, 37th Massachusetts volunteers; admitted February 15, 1863. Chronic diarrhœa. [The register of the hospital of the 1st Division, 6th Corps, shows that this man was admitted to that hospital January 19th, and sent to Washington February 14th; the diagnosis recorded is typhoid fever.] He stated that he had suffered for some months with a slight diarrhœa, when, December 27, 1862, he was attacked with measles, followed by a severe cough. During this attack the diarrhœa ceased. While convalescing he suffered two relapses from exposure, and when admitted to this hospital was quite weak, had some cough, and a diarrhœa which had recently come on. His appetite was fair, tongue clean and moist, and pulse 114. There was no special change until February 20th, when he said he felt better, but was much weaker, and died February 22d. *Autopsy* twenty-seven hours after death: Body emaciated; rigor mortis slightly marked; abdomen collapsed; muscles pale. The right lung exhibited scattered yellow tubercles in the upper and middle lobes, with mucopus in the bronchial tubes; the left lung presented one cavity in the upper lobe as large as a hen's egg, with a number of smaller ones from the size of a pea to that of a hazel-nut; these cavities had yellow opaque walls about one line in thickness; there were some yellow tubercles in this lung, and its lower edge was œdematous. The bronchial glands were hard, enlarged, and filled with black pigment. The heart was small, flabby, pale, and remarkably free from external adipose tissue. The spleen was apparently healthy. The liver showed a marked differentiation between the red and yellow portions, the latter being comparatively large and pale. The mesenteric glands small and pale. The stomach contained a thin mucus mixed with bile, but its mucous membrane and that of the duodenum and jejunum was normal. Peyer's glands were normal. The small intestine was smeared over with thick adhesive mucus, stained with greenish-yellow bile, which was darker in the lower part of the jejunum but lighter through the ileum. There were one or two small ulcers near the ileo-cæcal valve. The colon contained thin yellow fæces; throughout its whole length the mucous membrane was greatly thickened and coated with pseudomembrane. The descending colon and rectum presented numerous ulcers of various sizes from a quarter of an inch to two inches in diameter, the membrane being softened, thickened, and undermined for some distance around the margins of the large ulcers.—Assistant Surgeon E. J Marsh, U. S. A. [Nos. 223 to 225, Medical Section, Army Medical Museum, are from this case. The specimens are three successive portions of the greatly thickened colon, the mucous membrane of which is coated with a pseudomembranous layer. In Nos. 221 and 225 there are many follicular ulcers, which in three or four patches have extended into eroding excavations, the largest of which is an inch and a half long by an inch wide.]

CASE 267.—Private Shipman Griffin, company C, 122d New York volunteers; admitted February 15, 1863, with chronic diarrhœa. Died, April 3d. [It appears from the register of the regimental hospital of the 122d New York volunteers, near Falmouth, Virginia, that this man was treated in that hospital during December, 1862, and the early part of January, 1863. January 17th, typhoid fever is entered opposite his name; January 19th, sent to division hospital at Aquia Creek. The register of the hospital of the 1st Division, 6th Corps, shows that he was admitted to that hospital January 19th, and sent to Washington February 14th; the diagnosis recorded is chronic enteritis.] *Autopsy:* The colon was thickened, and presented well-marked follicular ulcers. [The condition of the other organs is not recorded.]—Assistant Surgeon Elias J. Marsh, U. S. A. [No. 203, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the descending colon, which is thickened, and presents a number of follicular ulcers.]

The next thirty-three cases are from the case-book and medical descriptive lists of the HAREWOOD HOSPITAL, Washington, D. C., Surgeon Thomas Antisell, U. S. V., in charge

from October, 1862, to September, 1863; Surgeon Reed B. Bontecou, U. S. V., for the rest of the time:

Case 268.—Private Nathan L. Brown, company C, 4th Vermont volunteers; admitted September, 1862. Chronic diarrhœa. Died, October 31st. *Autopsy:* The viscera of the thorax were normal. The stomach was pale, but otherwise healthy. The lower part of the duodenum appeared somewhat congested. The jejunum and ileum were congested in patches, the intensity of the congestion increasing toward the ileo-cæcal valve. The colon and rectum were very much inflamed; in the ascending colon there were five ulcers, a large one at the commencement of the descending colon, and another, which appeared to be granulating, in the rectum. The mucous membrane of the rectum was thickened. The liver was normal. The spleen considerably enlarged and very much engorged with blood.

Case 269.—Private Thomas Burt, company E, 29th Massachusetts volunteers; admitted October 7, 1862. Chronic diarrhœa. Died, October 31st. *Autopsy:* The stomach presented the normal appearance, except that its mucous membrane was pale. The small intestine was congested in patches, which increased in intensity toward the ileo-cæcal valve. At the lower end of the jejunum there was an intussusception three inches long. The colon was very vascular, its mucous membrane thickened and ulcerated throughout; in the descending colon were numerous perforations connecting with the peritoneal cavity. The walls of the rectum were thickened; its mucous membrane of a dark-green color. The liver showed no marked evidence of disease; the gall-bladder was distended with bile. The spleen was very much enlarged and congested.

Case 270.—Private Perry Hite, company E, 2d Pennsylvania volunteers; admitted September 4, 1862. Chronic diarrhœa. Died, November 2d. *Autopsy:* The thoracic viscera were anæmic, but presented no marked evidences of disease. The ventricles of the heart contained colorless fibrin-clots. The stomach was distended with flatus, but healthy. The duodenum slightly congested. The jejunum and ileum were healthy to within two feet of the ileo-cæcal valve; from thence highly congested and inflamed. The colon was inflamed, ulcerated, and presented gangrenous patches, with general abrasion of the mucous membrane. The rectum was inflamed and its lower portion much ulcerated. The mesenteric glands were enlarged and engorged with blood; the mesentery was much congested. The liver was normal. The spleen enlarged and very much congested.

Case 271.—Private Michael McMahon, company I, 105th New York volunteers; admitted November 11, 1862. Chronic diarrhœa. Died, November 15th. *Autopsy:* The lungs were healthy. The pericardium contained two ounces of fluid. The heart was somewhat enlarged; its ventricles filled with dark coagula. The liver was normal. The spleen much enlarged, congested, and softened. The stomach was large and inflated; its mucous membrane covered with a pseudomembrane the color of bile. The small intestine was normal in its upper part, somewhat congested in the lower part; just above the ileo-cæcal valve were two ulcers, five inches long and six lines wide, which had nearly perforated the gut. The large intestine was thickened, ulcerated, and covered with dark-colored false membrane, but the ulcers appeared to be cicatrizing. The rectum was in a similar condition to the colon, but even more diseased.

Case 272.—Private Owen Kenan, company C, 2d New York artillery; admitted October 7, 1862. Chronic dysentery. [The register of the Convalescent hospital, Fort Ellsworth, Virginia, shows that this man was admitted to that hospital August 24th—intermittent fever—transferred to Harewood hospital.] Died, November 23th. This patient was found dead in his bed about midnight by the attendant; for some days previous he had been able to sit up, and was supposed to be getting better. *Autopsy:* There was slight effusion beneath the arachnoid, but the brain-substance appeared healthy. The small intestine was congested in patches. The colon, which was distended with gas, contained fæcal matter of fair consistence; the whole tract of the colon and rectum presented innumerable ulcers in a state of cicatrization. The mucous membrane of the rectum was thickened. The liver was congested; the gall-bladder full of bile. The spleen was much enlarged and softened. Both kidneys were in a state of fatty degeneration, which was most marked in the right.—Assistant Surgeon Josiah F. Day, jr., 10th Maine volunteers.

Case 273.—Private Jewell F. Colton, company L, 2d Maine cavalry; admitted January 2, 1863. Chronic diarrhœa of three months' standing. This man had the diarrhœal countenance, and a painful bloody discharge from the bowels almost every hour; his pulse was small and frequent. He was treated at first with dilute sulphuric acid and laudanum, and the discharges diminished in frequency to from seven to nine in the twenty-four hours, but continued painful. Subsequently pills of tannin, ipecacuanha and opium were resorted to, under the influence of which the discharges decreased in frequency to four or five daily, the pain ceased, the pulse became fuller and less frequent, and the appetite improved. The pills were then discontinued, and laudanum alone given; the stools diminished to two daily, and the patient's condition apparently improved very much, so that twenty-four hours before his death he was sitting up and writing. Died, February 6th, at 9.15 A. M. *Autopsy:* The abdominal cavity contained about twenty-four ounces of serum. The ileum presented several patches of congestion. The colon was thickened, softened, and ulcerated in many places; some of the ulcers seemed to be cicatrizing. The liver was congested. The spleen enlarged. The kidneys and bladder normal. The mesenteric glands enlarged.—Acting Assistant Surgeon H. Hirshfield.

Case 274.—Private M. T. Remick, company K, 29th Massachusetts volunteers; admitted February 8, 1863, from Windmill Point hospital. Chronic diarrhœa. He was much emaciated. The stools were frequent, for the most part bilious, yellow, and slimy, but sometimes bloody. Died, February 17th. *Autopsy:* Body much emaciated. The heart and lungs were pale and flabby, but otherwise normal. The omentum was almost entirely absorbed. The stomach was contracted, its walls much thickened. The spleen was hard and congested. The liver was enlarged, but apparently healthy in texture. The

gall-bladder was distended with bile. There were extensive peritoneal adhesions, especially along the course of the colon. The mesenteric glands were somewhat enlarged. The small intestines were much congested. The colon and rectum were much inflamed, with spots of ulceration and softening of the mucous membrane.

CASE 275.—Private Edward McMahon, company E, 71st New York volunteers; admitted December 31, 1862. Dysentery of four months' standing. Died, February 20, 1863. *Autopsy:* Body very much emaciated. There were tubercles in the apex of the left lung. The pericardium contained half an ounce of serum, and colorless fibrin clots were found in the ventricles of the heart. The peritoneum was much congested; the abdominal cavity contained eight ounces of serum. The liver was somewhat enlarged and congested. The spleen and pancreas were small. The stomach, duodenum, and jejunum appeared nearly normal. The mucous membrane of the ileum and colon was thickened and softened; that of the rectum was dark-red and much ulcerated. The bladder contained several ounces of urine.

CASE 276.—Private John A. Chollar, company K, 21st Connecticut volunteers; admitted February 8, 1863, from Windmill Point hospital. Chronic rheumatism, with diarrhœa. This man had a feeble pulse and considerable œdema of the feet and legs, but was not very much emaciated or prostrated when first admitted. At that time the stools were frequent and bloody; they afterward became bilious. Treatment: At first a scruple each of Dover's powder and mercury with chalk, divided into six powders, once every four hours; afterward wine, milk-punch, and brandy in small quantities. Died, February 23d. *Autopsy:* Peritoneal adhesions were found along the whole length of the colon, especially in the transverse portion. The stomach was distended with a liquid containing bile. The intestines were filled with fæcal matter of normal consistence, and highly colored with bile. The small intestine was healthy. The large intestine was ulcerated, especially in the sigmoid flexure and rectum; the ulcers were deeply stained with biliary coloring matter; the follicles of the colon were much enlarged. The liver was normal; the gall-bladder greatly distended with bile. The spleen normal. Some of the matter from the colon ulcers, examined under the microscope, was found to contain pus-corpuscles, fat-globules, debris of tissue, and crystals of cholesterin.

CASE 277.—Private William C. Corey, company E, 20th Michigan volunteers; age 22; admitted January 2, 1863. Chronic diarrhœa. Died, March 11th. *Autopsy:* Body much emaciated; rigor mortis complete; suggillation posteriorly. Right lung healthy; left lung adherent. The pericardium was everywhere adherent. Heart normal. The stomach, duodenum, and jejunum were congested. The ileum was thickened, softened, and ulcerated in several places; some pseudomembrane adherent to its lower portion. The colon was thickened, softened, and presented patches of pseudomembrane and many follicular ulcers. The liver was somewhat enlarged. The spleen, pancreas, kidneys, and bladder normal.—Surgeon Thomas Antisell, U. S. V. [Nos. 156 to 159, Medical Section, Army Medical Museum, are from this case. No. 156 is from the lower portion of the ileum, which is thickened, irregularly coated with pseudomembrane, and presents some superficial ulceration. Nos. 157 to 159 are successive portions of the thickened colon, which is irregularly plastered with pseudomembrane, and presents a number of follicular ulcers.]

CASE 278.—Private Charles S. Postles, company C, 1st Delaware cavalry; age 29; admitted January 25, 1863. Diarrhœa. At the time of admission this man appeared to be in feeble health. He said he had been shipwrecked on the coast of New Jersey in the winter of 1852, and had almost perished from exposure to wet and cold. His feet were frost-bitten, and he had not enjoyed good health since. January 27th: Had a slight chill last night. He complains of pain in the head; mouth somewhat dry; tongue slightly coated and of a brownish color; pulse 100 and easily compressible; eyes somewhat suffused; respiration natural. To take two grains of mercury with chalk every six hours. February 2d: Complains that he cannot sleep; pulse 100. To take four grains of Dover's powder every four hours. February 5th: Pulse about the same; skin continues dry; tongue moister and not so dark; less heat of surface than before; still complains of loss of sleep. Continue the Dover's powder. February 10th: Pulse 95; tongue and mouth moister; skin natural to the touch; slight moisture about the forehead and neck. Continue treatment. February 15th: Pulse 90; tongue clean; skin relaxed; slight perspiration. Stop the Dover's powders. To take a tablespoonful of whiskey every hour. February 18th: Patient still improving; pulse 90, fuller and softer; again complains of sleeplessness. Continue the whiskey. To take six grains of Dover's powder every six hours. March 1st: Continues to convalesce; is able to sit up and walk unsupported several steps; appears cheerful, and has a moderate appetite. March 7th: Slight diarrhœa. To take ten drops of laudanum, with twenty of tincture of catechu, every four hours; brandy in tablespoonful doses. March 15th: Discharges from the bowels, consisting of serum and mucus only, very frequent since last night. The patient is quite prostrated, and refuses to take nourishment. To take four grains of quinine every four hours in a tablespoonful of brandy, and alternating with this every four hours a powder containing two grains of acetate of lead, half a grain of tannic acid, and three-quarters of a grain of opium. An enema of starch and laudanum was also directed. The diarrhœa, however, continued unchecked, and the patient died March 19th, at 6 A. M. *Autopsy:* The pericardium was somewhat thickened, and contained about four ounces of serum. Heart and lungs normal; no pleuritic adhesions. The stomach hung perpendicularly, the pyloric end reaching two inches below the umbilicus; its mucous membrane was normal but somewhat pale. The mucous membrane of the lower portion of the jejunum was dark-red and soft. The ileum was not as red as the jejunum, but presented many ulcerated patches with raised edges; these corresponded in position to the patches of Peyer. The colon was very much thickened, ulcerated, and coated with patches of pseudomembrane. Rectum in the same state as the colon. Liver and spleen normal. The gall-bladder somewhat larger than usual, and filled with bile. The left kidney was greatly enlarged, perhaps six times its normal size, and presented numerous cysts filled with fluid, varying in size from a line to three-quarters of an inch in diameter; the right kidney was also full of cysts, and about twice its natural size.—Surgeon Thomas Antisell, U. S. V. [Nos. 161 to 164, Medical Section, Army Medical Museum, are from this case. No. 161 is a portion of the ileum with hypertrophied villi, and a thickened Peyer's patch in which there are two ulcers. Nos. 162 and 163 are successive portions of the colon plastered with pseudomembrane, which has irregularly separated, exposing the

submucous coat, from which the portions of pseudomembrane project as little islets, giving the appearance of coarse granulations. No. 164 is the cystic kidney above described; the cysts were filled, when fresh, with fluid of various colors—yellow, bluish, brownish, and greenish.]

Case 279.—Private Thomas Nales, company A, 71st Pennsylvania volunteers; age 23; admitted March 5, 1863. This man was much emaciated; pulse 60 and feeble; tongue furred, white in the centre, edges red, papillæ raised. He had from ten to fifteen bloody purulent looking stools daily; there was severe pain in the lower abdomen, and tenderness on pressure, with anorexia and much thirst. Treatment: Blue mass, opium, solution of pernitrate of iron, sulphate of quinia, milk-punch, &c. Died, April 5th. *Autopsy:* The body was much emaciated; the abdomen flat and sunken. There were pleuritic adhesions on both sides. The heart was normal. The liver pale; the gall-bladder much distended. The spleen was four and a half inches long by two and three-quarters wide. The kidneys normal; the bladder distended with urine. The mucous membrane of the stomach and small intestine was much congested. The colon was much thickened, and there were ulcerated patches in its lower portion. The rectum was ulcerated throughout.

Case 280.—Private William H. Hawkhurst, company G, 17th Connecticut volunteers; age 30; admitted April 21, 1863, with diarrhœa of some duration. [According to the register of the hospital of the 11th Corps this man was admitted to that hospital, then at Brooks' Station, Virginia, April 14th, and sent to Washington April 20th; no diagnosis.] Stools frequent; pulse 100, small, and quite compressible; urine normal. Obstinate vomiting was a prominent symptom. Treatment: A blister to the epigastrium, bismuth and opium, &c. The vomiting, however, continued, and the patient died April 26th. *Autopsy:* Body not much emaciated. There were old pleuritic adhesions on the right side; lungs healthy. Heart slightly enlarged; mitral valve thickened, its free edges covered with vegetations; the tricuspid valve and the aortic semilunar valves somewhat thickened; foramen ovale open, the opening a quarter of an inch in diameter. The stomach contained half a pint of green grumous fluid; its mucous coat was much thickened, softened, and inflamed, the rugæ very prominent. The mucous membrane of the lower half of the ileum, and of the colon, except the transverse arch, was in a similar condition. Liver somewhat enlarged, its structure healthy; gall-bladder distended. Spleen normal. Kidneys enlarged, their cortical portion pale, their pyramids congested.—Acting Assistant Surgeon N. C. Stevens.

Case 281.—Private Max Uppenheimer, company E, 41st New York volunteers; age 22; admitted April 21, 1863, from the 11th Army Corps. Chronic diarrhœa of four months' standing, with anasarca for the last two months. He was emaciated and pallid; pulse 120 and feeble; had twelve serous, highly offensive stools daily, which were sometimes involuntary. Treatment: Solution of pernitrate of iron, opium, and port wine. Died, April 30th. *Autopsy:* Body emaciated; extremities œdematous. The heart was smaller than usual, but apparently normal. A small encysted calcareous deposit was found in one of the lungs. The abdominal cavity contained eight pints of serum, with floating shreds of organized lymph; numerous small cysts resembling hydatids were attached to the mesentery. The stomach was small, pale, and empty; its mucous coat appeared to be slightly thickened. The intestines were distended with gas. Appearances of recent inflammation were observed in the lower part of the ileum, particularly within six inches of the ileo-cæcal valve, but no ulceration of Peyer's glands. There were numerous minute ulcers in the colon, some of them penetrating to the peritoneal coat; these were most numerous in the descending colon. The liver was healthy; the gall-bladder distended with bile. The spleen was congested and softened, but normal in size. The mesenteric glands were enlarged and somewhat indurated. The kidneys normal; the bladder distended with urine.—Acting Assistant Surgeon Thomas H. Elliott.

Case 282.—Sergeant John Fröhlich, company F, 98th Pennsylvania volunteers; age 30; admitted April 21, 1863. Diarrhœa of nearly four months' duration, contracted near Falmouth, Virginia, in the army of the Potomac. Died, May 7th. *Autopsy:* Body much emaciated. The upper part of the right lung was firmly adherent to the thoracic parietes; the lung itself was normal; the lower portion of the left lung was hepatized, the rest of the lung congested; there were extensive pleuritic adhesions on this side. Heart healthy; the pericardium contained three ounces of serum. The liver was normal in size but much congested. The spleen very small. The mucous membrane of the stomach was slightly injected. Duodenum and jejunum normal. The ileum was normal to within three feet of the ileo-cæcal valve; below this point it was dark-brown or blackish, much injected, thickened, but not ulcerated. The large intestine was much thickened and darkly congested, but there was no abrasion of the mucous surface. Kidneys of normal size, but much congested.—Acting Assistant Surgeon Odrey D. Brooks.

Case 283.—Private Jefferson McCullough, company H, 20th Indiana volunteers; age 23; admitted from field hospital, Falmouth, Virginia, April 21, 1863. Chronic diarrhœa. He was very feeble and much emaciated. Died, May 13th. *Autopsy:* A portion of the lower lobe of the right lung was hepatized. The bronchi contained pus. The heart was normal. The mucous membrane of the stomach and small intestine was pale and softened. The mucous membrane of the lower part of the ileum and large intestine was extensively ulcerated; the membrane between the ulcers was pale and softened, with occasional red patches. The liver was healthy; the gall-bladder distended with bile. The kidneys normal; the urinary bladder empty.—Assistant Surgeon Odrey D. Brooks, 26th Michigan volunteers.

Case 284.—Private Henry C. White, company A, 25th Ohio volunteers; admitted April 21, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 25th Ohio volunteers, then at Brooks' Station, Virginia, as admitted March 1st—acute diarrhœa—sent to division hospital March 29th. The register of the hospital of the 1st Division, 11th Corps, shows that he was admitted to that hospital March 29th—chronic diarrhœa—sent to Washington April 20th.] Died, May 15th. *Autopsy:* The body was much emaciated. The lungs and heart were healthy. The pericardium contained a small amount of fluid. The stomach was much injected, and small patches of pseudomembranous lymph were adherent at several spots. The duodenum and jejunum were slightly injected. The mucous membrane of the ileum was much injected, and thickly

covered with lymph similar to that in the stomach. The large intestine was coated throughout with a similar exudation, the rectum partially so; no ulcers were observed anywhere. The liver and spleen were normal. The kidneys large.—Acting Assistant Surgeon A. H. Haven.

CASE 285.—Private Charles Blydenburgh, company C, 71st New York volunteers; admitted June 15, 1863. Chronic diarrhœa. Died, June 30th. *Autopsy:* Body not much emaciated. The lungs were normal. The pericardium contained two ounces of bloody serum; the heart was of a dark-purple color and flabby; it seemed to be stained with blood. The small intestine was healthy. There were numerous ulcers throughout the large intestine; the rectum was much injected, and presented numerous small ulcers. The liver was healthy; the gall-bladder moderately full of bile. The spleen and kidneys normal.—Acting Assistant Surgeon A. H. Haven.

CASE 286.—Private Lorenzo Young, company B, 6th Ohio volunteers; age 20; admitted August 17, 1863. Chronic diarrhœa. This man had been sick about four weeks and was greatly emaciated. His pulse was feeble and irregular; tongue dry; dejections frequent and bloody. He complained of pain and tenderness along the track of the colon. There was no tympanites. Died, August 26th. *Autopsy:* Body much emaciated. Heart and lungs healthy. The liver weighed seventy-one ounces; the gall-bladder was much distended with bile. The spleen healthy, weight nine ounces. The stomach was somewhat injected. The duodenum, jejunum, and upper part of the ileum healthy; the lower part of the ileum was very much injected; twelve well-marked old ulcers were counted within a foot of the ileo-cæcal valve. The colon was much ulcerated, especially in the sigmoid flexure. The kidneys were healthy.—Acting Assistant Surgeon Lloyd Dorsey. [Nos. 151 and 152, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the somewhat thickened colon. In the lower part of No. 151 there is an irregular ulcer, six lines in long diameter, which penetrates to the muscular coat. No. 152 presents a number of larger ulcers of similar character. These ulcers have apparently resulted from the separation of diphtheritic sloughs.]

CASE 287.—Private Joseph Gerard, company F, 140th New York volunteers; admitted August 18, 1863. Acute diarrhœa. Died, September 14th, at 4 A. M. *Autopsy:* Not much emaciation. The lungs were somewhat congested. The heart and pericardium normal. The liver was fatty, and weighed about seventy-two ounces; the gall-bladder was distended. The spleen normal. The mucous membrane of the stomach was thickened, softened, and slightly congested near the cardiac orifice. The duodenum was slightly congested; the jejunum healthy. The ileum and colon were congested in patches; in the ascending and descending colon the mucous membrane was softened. The rectum was slightly congested. The kidneys were normal.

CASE 288.—Private Henry Henning, 1st Virginia battery; admitted October 10, 1863. Chronic diarrhœa. Died, October 13th. *Autopsy* the same day: Body slightly emaciated. The upper lobe of the right lung was somewhat adherent; the left lung pale but healthy. The pericardium contained three ounces of serous fluid; the heart was normal. The liver weighed about fifty-nine ounces; the spleen eleven ounces. The duodenum was normal; the jejunum congested; the ileum somewhat congested throughout. The ascending and transverse colon somewhat congested and thickened; an old ulcer was observed at the junction of the transverse and descending colon. The rectum was contracted and thickened; its mucous membrane softened and greenish, but not ulcerated. The kidneys were much congested; weight, nine ounces each; on the under surface of the left kidney was a cyst about an inch in diameter filled with cheesy matter. The interior of the suprarenal capsules was occupied by a grumous mass resembling decomposed blood.

CASE 289.—Private Thomas Nugent, 33d company, 2d battalion, Invalid Corps; admitted September 15, 1863. Chronic diarrhœa. Died, October 14th. *Autopsy:* Body much emaciated. The right lung contained several large tubercular masses in its upper lobe; lower lobes healthy; the left lung was a mass of tubercles, and presented several large cavities. Heart normal. The liver was fatty, and weighed about seventy-five ounces; the gall-bladder was distended. The spleen weighed fourteen ounces. The anterior portion of the stomach was congested. The duodenum was healthy; the jejunum slightly congested; the upper portion of the ileum much congested, the middle portion slightly so; the lower portion was much congested and presented several small ulcers. The cæcum was ulcerated; the ascending colon congested and thickened in patches; the remainder of the colon thickened and ulcerated; the rectum studded with ulcers. The kidneys were healthy.

CASE 290.—Private Hiram D. Bussell, company C, 6th Vermont volunteers; admitted October 10, 1863. Chronic diarrhœa. Died, October 15th. *Autopsy:* Body very much emaciated. Both lungs were studded with small tubercles, some of which had ulcerated. The heart was normal. The liver was slightly hypertrophied and somewhat fatty; gall-bladder distended. Spleen softened, but normal in weight. Stomach and upper portion of duodenum congested. The jejunum was thickened and presented patches of ulceration; the upper portion of the ileum was in the same condition, the lower portion healthy. The ascending and transverse colon were thickened and studded with ulcers; the descending colon and rectum were much thickened and extensively ulcerated. The kidneys were enlarged; near the middle of the right kidney was an abscess of some size.

CASE 291.—Private George W. Berg, company A, 155th New York volunteers; admitted October 18, 1863. Chronic diarrhœa. Died, October 26th. *Autopsy:* No emaciation. Lungs normal; pleuritic adhesions on the left side. Heart normal. The liver weighed about sixty-four ounces. The spleen was softened. The stomach normal. The duodenum, jejunum, and upper ileum were thickened, but not ulcerated. The mucous membrane of the ileum near the ileo-cæcal valve was softened. Peyer's glands were not inflamed, nor were any indications of inflammation observed in the colon. The kidneys were fatty, and weighed about eight ounces and a half each.

CASE 292.—Private C. M. Andrews, 11th New York battery; admitted October 10, 1863. Chronic diarrhœa. Died, October 28th. *Autopsy:* Body greatly emaciated. Right lung normal; the left lung hepatized. Slight effusion into the pericardium. The heart weighed about six ounces. Liver and spleen normal; gall-bladder not distended. The stomach was

slightly congested; the duodenum and jejunum congested and thickened; the ileum also was congested, but there was no ulceration of Peyer's patches. The colon and rectum were congested; the ascending colon somewhat ulcerated. The kidneys were normal.

CASE 293.—Private Charles Benedict, company C, 17th Connecticut volunteers; admitted April 21, 1863. Debility from fever and chronic diarrhœa. Treatment at first opium and tannin, then Dover's powder, afterward quinine and iron. May 26th: Was furloughed. May 29th: Returned from furlough laboring under a relapse. He had twenty thin, yellowish, bloody stools during the day. Treatment: Decoction of flaxseed with opium internally, enemata of starch and opium, nutritious diet, sinapisms to the abdomen. On the 30th there were six stools, and hiccough set in; pulse 160; countenance hippocratic; vomiting; profuse cold sweat. Treatment: Lime-water, pills of opium and camphor, sinapisms to the abdomen and neck. Died, May 31st, at 5 P. M. *Autopsy:* The body was not much emaciated. There were pleuritic adhesions on both sides; firm on the right side, slight on the left. The lungs were pale, but apparently healthy. The heart was rather small, pale, and coated with fat; there was a large, fibrinous, yellow clot in the right ventricle. The liver was mottled and fatty; the gall-bladder distended with greenish bile. The spleen was congested and softened. The stomach and duodenum were injected in patches. The jejunum was lead-colored, portions of it much injected. The ileum was much congested; its solitary follicles were enlarged to the size of small shot. The ascending colon was much injected, and showed the cicatrices of former ulcers; the transverse colon was pale; the follicles were enlarged slightly, with minute depressions on their summits; the rectum was pale, and dotted with points of ulceration extending as far upward as the sigmoid flexure.—Acting Assistant Surgeon H. Hirshfield.

CASE 294.—Private B. M. Terwilliger, company C, 143d New York volunteers; admitted from his regiment August 19, 1863. Chronic diarrhœa. Died, November 5th. *Autopsy:* Body greatly emaciated. The heart was normal. There were slight pleuritic adhesions on both sides; tubercular cavities in the upper lobe of the right lung, its lower lobe hepatized. The liver, spleen, and kidneys were normal. There were patches of congestion throughout the whole intestinal canal, especially in the lower portion of the ileum. The mucous membrane of the stomach was softened; that of the rectum thickened.

CASE 295.—Private John S. Winter, company K, 111th New York volunteers; admitted February 1, 1864, from the army of the Potomac. Chronic diarrhœa. [It appears from the register of the regimental hospital of the 111th New York volunteers, then with the army of the Potomac in Virginia, that this man was treated in that hospital for chronic diarrhœa from December 4, 1863, to February 1, 1864.] Died, February 4th. *Autopsy:* The body was considerably emaciated. The thoracic viscera were normal. The stomach was healthy. The lower ileum was congested in patches, but Peyer's patches were not affected. The large intestine was intensely congested and showed minute ulcers throughout. The liver weighed eighty-six ounces; the gall-bladder was very much distended with bile. The spleen was normal. The kidneys large, friable, and well covered with fat.—Acting Assistant Surgeon Lloyd Dorsey.

CASE 296.—Private Joseph Jabbit, company H, 9th New York State militia; admitted from the army of the Potomac February 1, 1864. Chronic diarrhœa. Died, February 4th. *Autopsy:* Body much emaciated. Thoracic viscera healthy. The peritoneal cavity contained a quantity of fæcal matter. The stomach was distended. The duodenum and jejunum were healthy. The lower ileum was intensely congested. Peyer's patches were healthy. The colon was ulcerated; a perforation the size of a silver dollar was found in the sigmoid flexure. The liver was friable, breaking down readily under pressure, but natural in size. The spleen was very small, weighing but two ounces. The kidneys normal.—Acting Assistant Surgeon J. W. Fitzpatrick.

CASE 297.—Private Henry Miller, company I, 26th Michigan volunteers; admitted February 1, 1864, from the army of the Potomac. Chronic diarrhœa. [It appears from the register of the regimental hospital of the 26th Michigan volunteers, that this man was treated in that hospital, then near Stevensburg, Virginia, for diarrhœa from January 14th to February 1st.] Died, February 6th. *Autopsy:* Emaciation extreme. The right lung normal; in the left lung there were from ten to fifteen patches of lobular pneumonia from the size of a chestnut to that of a hen's egg. The heart was normal. The pericardium contained half an ounce of serum. Liver normal. The spleen somewhat enlarged. The pancreas indurated. The stomach, duodenum, jejunum, and the upper three-fourths of the ileum were healthy; the lower fourth was injected, and its mucous membrane softened. The ascending colon was healthy; the remainder of the large intestine was highly injected, and presented numerous ulcers, particularly in the sigmoid flexure. The peritoneal cavity contained about four ounces of straw-colored serum. The bladder was empty.—Acting Assistant Surgeon N. C. Stevens.

CASE 298.—Sergeant Henry Elmer, company F, 16th Pennsylvania cavalry; admitted February 1, 1864, from the army of the Potomac. Chronic diarrhœa. Died, February 20th. *Autopsy:* Thoracic viscera normal. The liver weighed ninety ounces. The spleen was normal. The duodenum, jejunum, and upper ileum were healthy; the lower third of the ileum and the entire colon were livid, and presented patches of ulceration; the mucous membrane was softened. The kidneys were enlarged and fatty.—Acting Assistant Surgeon J. W. Fitzpatrick.

CASE 299.—Sergeant James T. Rook, company D, 26th Michigan volunteers; admitted February 1, 1864, from the army of the Potomac. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 26th Michigan volunteers, then near Stevensburg, Virginia, as admitted December 22, 1863—diarrhœa—sent to hospital February 1, 1864.] Died, March 13th. *Autopsy:* The body was greatly emaciated. There were slight pleuritic adhesions on both sides, but the parenchyma of the lungs appeared healthy. On the anterior surface of the heart was a small, oblong, semi-cartilaginous patch, with fimbriated edges; it did not involve the muscular walls. The stomach and duodenum appeared healthy. The upper third of the ileum was injected; the lower two-thirds were intensely congested, and the mucous membrane much softened. The colon presented patches of inflammation, but there were no ulcers. The liver and spleen were normal. The kidneys were slightly enlarged; the cortical substance was cream-colored, the pyramids natural.—Acting Assistant Surgeon N. C. Stevens.

CASE 300.—Private William Armstead, company C, 2d United States colored troops; admitted January 17, 1866. Chronic dysentery, contracted while on duty with his regiment in Florida. At the time of admission the patient was in a dying condition, and had profuse hæmorrhage from the bowels; this was controlled by astringent injections, and supporting measures were employed, together with opiates and astringents. He rapidly sank, however, and died January 23d. *Autopsy:* The solitary follicles of the ileum were enlarged, and there was a deposit of black pigment in the patches of Peyer and in the summits of the villi. The colon was thickened, ulcerated, and coated with pseudomembrane between the ulcers.—Surgeon Reed B. Bontecou. [Nos. 704 to 705, Medical Section, Army Medical Museum, are from this case. No. 704 is a portion of the ileum, taken near its middle, in which the solitary follicles are enlarged and the villi hypertrophied. When fresh, the extremity of each villus presented a black pigment deposit. No. 705 is the lower extremity of the ileum, with the ileo-cæcal valve and a small portion of the cæcum. The last Peyer's patch is somewhat thickened; the surrounding mucous membrane presents the same lesions as No. 704. No. 705 is a portion of the descending colon, which is considerably thickened and ulcerated. The ulcers are fringed with pseudomembrane, which hangs in shreds from their edges.]

## The next thirty cases are from the case-book and medical descriptive lists of the DOUGLAS HOSPITAL, Washington, D. C., Assistant Surgeon William Thomson, U. S. A., in charge from February, 1863, to September, 1864, and after September, 1865; Assistant Surgeon William F. Norris in charge from October, 1864, to September, 1865:

CASE 301.—Private W. G. Iredell, company H, 28th New Jersey volunteers; age 38; admitted February 13, 1863. Chronic diarrhœa. February 15th, when first seen by the reporter, the patient was greatly prostrated, emaciated, and without appetite. He had six stools in the twenty-four hours; they were thin, partly dark, partly yellow; occasionally scybala were passed, but no blood. There was not much pain or tympanites; pulse 90; skin dry and cool; intellect dull. To take three grains of quinine and one-eighth of a grain of morphia three times a day. A pint of scalded milk daily, and half diet. February 23d: Seems much better; spirits good; pulse 95; skin moist; tongue clean or nearly so; bowels moved four times in the last twenty-four hours; appetite better. Continue treatment and diet. February 28th: Pulse 100; skin natural; no tormina or tenesmus; bowels moved about four times in the twenty-four hours; appetite good. Continue treatment and diet; a Dover's powder at bed-time. March 6th: Tongue moist; pulse 110; bowels moved four times in the last twenty-four hours. There is a good deal of tenderness on pressure in the left lumbar region; appetite tolerable, eats bread and milk. March 9th: The tenderness on pressure in the left lumbar region is greater, and extends to the inguinal region. Bowels moved but three times in the last twenty-four hours; pulse 120; some sordes on the teeth; subsultus tendinum. Died, March 10th. *Autopsy* ten hours after death: Body much emaciated. The omentum was small, devoid of fat, and its vessels much congested. The walls of the stomach were very thin. There were one or two ulcerated points in the small intestine, and a number of small ulcers in the large, chiefly in the descending colon. The liver, spleen, and left kidney were healthy; the right kidney was enlarged.—Acting Assistant Surgeon Henry L. W. Burritt.

CASE 302.—Private Jacob Mehn, company I, 108th New York volunteers; age 34; admitted February 13, 1863. Typhoid fever. This man was taken sick at Aquia Creek and brought here in a very low and emaciated condition after being sick three weeks. He was very feeble; pulse 110; tongue clean and red; stools liquid and frequent. He was treated with powders of opium and tannin; diet of scalded milk. February 27th: Somewhat better; pulse 95; tongue clean and moist; some appetite; stools less frequent. To take powders containing three grains of quinine and one-twelfth of a grain of morphia three times daily. March 2d: Pulse 85; skin moist; tongue clean but rather dry; bowels moved three times during the day; some tenderness in the umbilical and left iliac regions. Continue treatment; two eggs daily. March 12th: Appearance improved, looks much brighter and seems stronger; has moderate appetite; three stools in twenty-four hours; is still very feeble and greatly emaciated, but there is now no abdominal tenderness; tongue slightly red on the edges and inclined to dryness. Since the 6th has had suppositories of opium and tannin after each stool; milk-punch and beef-tea every four hours. March 17th: Is worse again; abdomen tympanitic and tender, the tenderness being greatest over the descending colon; there is no tenesmus; tongue and skin dry. Continue treatment. March 18th: Very weak; pulse 140; tongue and skin dry; considerable thirst; abdomen very tender and tympanitic. He complains of much pain in the epigastric region; had two stools in the last twenty-four hours, they were light-yellow and liquid; there is no tenesmus; micturition painful; the urine normal. The stomach retains stimulants and nourishment very well, but digestion and assimilation are wanting, and emaciation steadily progresses. Died, March 19th.—Acting Assistant Surgeon H. L. W. Burritt. *Autopsy:* Emaciation extreme. There were recent pleuritic adhesions of the lower lobe of the right lung, which was hepatized; the rest of the right lung and the left lung were normal. The heart was small but normal. The liver presented the nutmeg appearance; it was one-third larger than natural. The spleen was somewhat indurated. The pancreas was firm. The kidneys were natural in size and texture, but the cortical portion was somewhat pale. Stomach much contracted. The lower part of the small intestine was injected in patches. The cæcum contained a number of small superficial ulcers. The mucous membrane of the colon was somewhat thickened, and presented numerous large ulcers, between which the mucous membrane was coated with pseudomembrane. In this case no symptoms observed during life called attention to the pulmonary lesion.—Acting Assistant Surgeon F. M. Holly. [Nos. 288 and 289, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the colon. In No. 288 the mucous membrane is irregularly coated with pseudomembrane; in the lower portion of the piece is a large irregular diphtheritic ulcer which penetrates to the muscular coat. In No. 289 there are several similar ulcers, but the mucous membrane between them presents very little adherent pseudomembrane.]

CASE 303.—Private J. S. Livingston, company K, 7th Wisconsin volunteers; age 32; admitted March 23, 1863. Chronic diarrhœa. Had contracted diarrhœa in September, 1862, but continued on duty until Christmas, when he was sent to the regi-

mental hospital for debility, having lost forty pounds in weight. [The register of the regimental hospital shows that he was admitted December 24th, and transferred to division hospital March 7th.] He was then transferred to field hospital, where he remained until March 22, 1863. [He appears on the register of the hospital of the 1st Division, 1st Army Corps, as admitted March 7th—chronic diarrhœa—sent to Washington, D. C., March 23d.] The diarrhœa had continued unchanged, averaging about three stools daily, except when temporarily aggravated by hard work or exposure. There had been very little pain or abdominal tenderness; the stools were small and light-colored; appetite good. His diet had consisted chiefly of hard bread and fresh or salt beef. When admitted to this hospital his pulse was nearly normal; tongue moist, and in the center covered with a yellowish-white fur; the skin dry; he had about three liquid light-colored stools daily; no abdominal tenderness; moderate appetite; micturition was frequent but not painful. He was very much emaciated. ℞. Nitrate of silver one grain, powdered opium and blue mass each half a grain, ipecacuanha quarter of a grain, every four hours. Water acidulated with nitric acid for drink; whiskey and beef-essence. March 27th: Substituted three grains of subnitrate of bismuth with quarter of a grain of sulphate of morphia every four hours. Diet: Milk, rice, mutton broth, eggs. April 7th: Seems somewhat better, but still has two or three stools daily; appetite moderate; tongue clean; is able to sit up a little. Discontinue medicine, and give an enema of one drop of creasote in an ounce of mucilage three times daily. April 15th: Two grains of quinine and ten drops of aromatic sulphuric acid three times daily. April 18th: Had five stools during the day, attended with tormina and tenesmus. Continue the quinine; give also bismuth and whiskey. April 20th: Still has five or six stools a day; bilious vomiting has set in, accompanied by loss of appetite. Stop the quinine. April 22d: The vomiting has ceased, but the diarrhœa continues about the same. He has become considerably emaciated; tongue red and dry. ℞. Opium one-third of a grain, acetate of lead two grains, every four hours. April 27th: Continues about the same. ℞. Elixir of opium twenty drops, subnitrate of bismuth four grains, every four hours. Died, May 8th. *Autopsy:* Old pleuritic adhesions about the lower lobe of the right lung; the posterior part of the upper lobe of the lung was hepatized; left lung normal. The liver was slightly enlarged and of a mahogany color. The intestines were somewhat congested in patches throughout their entire length, the congested patches being of a dark mahogany color, but no ulceration could be detected. Peyer's patches and the mesenteric glands were healthy.—Acting Assistant Surgeon Francis M. Holly.

Case 304.—Private J. W. Hoyt, company G, 17th Connecticut volunteers; age 22; admitted June 14, 1863. Scrofula and diarrhœa. [This man appears on the records of the hospital of the 11th Corps, Brooks' Station, Virginia, as admitted April 27th—scrofula; no disposition recorded.] The patient was a young man of feeble constitution, broken down by poor diet and fatigue. Has been subject to attacks of diarrhœa for some time, but it is now better. His chief trouble is the presence of scrofulous looking abscesses in the neck and arm; pulse 90. Ordered citrate of iron and quinia, extra diet, milk-punch, &c. June 17th: Two abscesses were opened to-day, one under the ear, the other under the chin; they discharged freely; appetite better; bowels regular; pulse 95. June 20th: Continues better except that new abscesses are forming freely in the neck. Ordered iodide of potassium and quinine in syrup of sarsaparilla. June 22d: Severe diarrhœa has set in; the stools are watery and yellow; pulse 100; great prostration and depression of spirits. ℞. Opium, tannin, catechu, and alum, of each one drachm; make fifteen pills. Take one every four hours until the bowels are checked. June 25th: The diarrhœa is somewhat better, but the condition of the patient otherwise is not improved; pulse 100; tongue dry and clean; skin moist and cool. Died, June 27th.—Acting Assistant Surgeon H. L. W. Burritt. *Autopsy* sixteen hours after death: The lungs were congested posteriorly, and the bronchi filled with thick yellow muco-pus. The heart was normal; its right ventricle was empty, the left filled with mixed coagula and fluid blood. The liver was large, but otherwise normal. The spleen contained several abscesses. The mesenteric glands were enlarged. The peritoneum and omentum were much injected. The lower portion of the ileum and the whole of the large intestine were extensively ulcerated, many of the ulcers perforating the muscular coat.—Acting Assistant Surgeon Carlos Carvallo.

Case 305.—Private Hugh Patterson, company E, 140th Pennsylvania volunteers; admitted July 29, 1863. Diarrhœa. This man had yellow discharges from the bowels, which contained small lumps of undigested food, but no blood. His abdomen was slightly tender on pressure; pulse 80 and feeble; skin cool; perspiration profuse; tongue coated with a white fur in the centre, red on the tip and edges. He stated that he had frequently suffered from intermittent fever since he entered the army. He was treated at first with pills of tannic acid and opium, and subsequently with pills of persulphate of iron, extract of gentian and opium. These measures seemed to control the diarrhœa somewhat, but on the 9th August he suddenly became delirious, his pupils dilated, his pulse very frequent; coma set in, and he died August 10th. *Autopsy* five hours after death: The brain was examined with great care, but nothing abnormal was detected, except, perhaps, some slight congestion of the pia mater. The transverse colon was inflamed, but not ulcerated. The lungs, heart, liver, spleen, kidneys, and stomach appeared to be normal.—Acting Assistant Surgeon William H. Letterman.

Case 306.—Private Anthony Arne, company K, 10th New York cavalry; age 27; admitted September 20, 1863. Acute dysentery. This man reported that he had been broken down by long marches in Virginia just after the battle of Gettysburg, and contracted a mild diarrhœa, which he neglected. Two weeks prior to his admission he got his feet wet, and the symptoms became more urgent, assuming a dysenteric character. When admitted he was much exhausted and considerably emaciated. During the twenty-four hours following his admission he had seven painful bloody passages, and sank into a state of stupor approaching coma. Died, September 22d. *Autopsy* twenty hours after death: The mucous membrane of the stomach was abraded. The whole large intestine coated with a diphtheritic layer. The gall-bladder filled with very dark viscid bile. The remaining viscera were normal.—Acting Assistant Surgeon Carlos Carvallo.

Case 307.—Private Adam Hart, company K, 6th Michigan cavalry; age 30; admitted from the army of the Potomac October 10, 1863. Chronic diarrhœa and consumption. This man was admitted in an advanced stage of chronic diarrhœa; he had also a constant cough and purulent expectoration. He stated that a year since he had copious hæmoptysis, which had recurred at intervals. His family have a phthisical proclivity. October 11th: Prescribed turpentine emulsion and elixir of opium; milk diet. October 19th: His stomach became irritable; the diarrhœa and cough are no better. Stop medicines:

brandy. October 21st: Prescribed tannin and opium. Died, November 3d. *Autopsy* fourteen hours after death: There were tubercles in the apices of both lungs, but no great amount of disease. The colon and rectum were extensively ulcerated. The other viscera were normal.—Acting Assistant Surgeon Francis M. Holly.

CASE 308.—Private George Joslyn, company A, 111th New York volunteers; admitted from the army of the Potomac November 4, 1863. Chronic diarrhœa. This patient was first seen by the reporter January 7, 1864. He was then exceedingly emaciated; his eyes sunken; pulse frequent and feeble. He had a continual desire to go to stool; his dejections were very thin, resembling colored water. He died January 15th. *Autopsy:* The solitary glands of the small intestine were inflamed, some of them ulcerated. There were several large ulcers in the patches of Peyer. The large intestine was contracted to about an inch in diameter, its coats much thickened; its mucous membrane was blackened by a deposit of pigment, and studded with numerous ulcers and cicatrices. The liver and kidneys were fatty. The other organs were normal. The brain was not examined.—Acting Assistant Surgeon Henry Gibbons, jr.

CASE 309.—Private Obed E. Taylor, company F, 105th Pennsylvania volunteers; age 35; admitted from the army of the Potomac February 1, 1864. Chronic diarrhœa. [It appears from the register of the regimental hospital of the 105th Pennsylvania volunteers that this man was treated in that hospital for diarrhœa in November, 1863, and again in January, 1864.] This man had been sick about four months. He was very weak, greatly emaciated, and in a very filthy condition. The stools were frequent, very thin, and of an ash-gray color; had severe tormina and tenesmus. A grain of opium was administered at once, with an ounce of whiskey, and a blister applied to the abdomen. February 2d: Slept very little last night; had several involuntary evacuations. ℞. Acetate of lead two scruples, opium ten grains, ipecacuanha one scruple; make forty powders. Take one three times daily; also a laudanum enema three times daily. Stimulants and milk diet. He continued about the same until February 7th, when symptoms of pneumonia of the lower lobe of the left lung set in, for which a blister was applied to the chest and fluid extract of seneka given internally. Milk-punch and beef-tea were freely administered. Died, February 10th. *Autopsy* six hours after death: Body emaciated; rigor mortis well marked. The left lung presented lobular pneumonia in the first stage. The liver was fatty. Peyer's patches were enlarged and injected. The large intestine was ulcerated and coated with pseudomembrane from the ileo-cæcal valve to the rectum. The right kidney was abnormally small. Acting Assistant Surgeon Carlos Carvallo.

CASE 310.—Private Augustus C. Falls, company K, 1st New York heavy artillery; age 18; admitted from Fort Marcy August 5, 1861. Acute diarrhœa. The patient stated that he had suffered from diarrhœa for two weeks, with five or six passages from the bowels daily. His general condition was good. Under treatment the stools diminished in the course of a day or so to two in the twenty-four hours; but the tongue becoming dry, he was ordered, August 7th, to take an ounce and a half of whiskey at dinner. August 10th: Pulse 100 and feeble. Ordered two ounces of whiskey three times daily. August 16th: The diarrhœa is checked; pulse 100 and feeble; is losing flesh. ℞. Citrate of iron and quinia two grains, three times a day. August 17th: Has a little inflammation of the fauces. Prescribed a gargle. August 25th: There is now no diarrhœa; pulse 90 and stronger; slight conjunctivitis is present, and an abscess has appeared over the left parotid gland. August 27th: The abscess was opened, and nearly half an ounce of healthy pus discharged. September 1st: Slight diarrhœa has again appeared; the abscess is doing well; the patient still loses flesh. Continue the quinine and iron, and the whiskey. September 7th: Is still losing flesh; has slight cough; pulse 90. September 8th: No diarrhœa; discovered a cold abscess in the axilla, which was opened and discharged an ounce and a half of thick healthy pus. On examination eight other cold abscesses were discovered in various parts of the body and limbs; these abscesses were all opened at once. They were situated as follows: One in the right axilla; one on the inner side of the middle third of the arm; one on the inner side of the upper third of the right forearm; one on the inner side of the lower third of the right forearm; one over the left breast; two near the spinal column, just inside of the lower angle of the scapula; one in the lower third of the left thigh, over the course of the femoral artery; one in the calf of the right leg. September 10th: The abscesses are all doing well except the one in the axilla, which discharges a black unhealthy pus. The patient is becoming much emaciated, but his cough is better, and he has little or no expectoration. September 14th: Pulse 92 and pretty good. Treatment continued. September 20th: Nearly all the abscesses have healed; there is no cough. September 29th: Has a severe attack of erysipelas in the face; pulse 110 and feeble. Ordered three ounces of whiskey every four hours, and tincture of the chloride of iron; face painted with tincture of iodine. September 30th: The erysipelas is spreading over the whole face; the left eye is closed. October 2d: The erysipelas is subsiding; pulse 100 and not so feeble. October 4th: Has been failing for the last twelve hours; pulse 120 and feeble; there is again a little diarrhœa. October 5th: Was slightly delirious last night; pulse very weak. Died, October 5th. Two days before death both feet became swollen, and spots of ecchymosis appeared on them, as well as along the course of the veins of the legs and on the chest. The abscess in the axilla discharged up to the day of his death. *Autopsy* sixteen hours after death: Rigor mortis very slight; body very much emaciated; spots of ecchymosis on the chest and lower extremities. The right lung was adherent to the walls of the thorax by bands of false membrane, which were easily torn; there were about three ounces of serum in the right pleural cavity; on section of the right lung it was found full of softened tubercles, especially in its posterior portions; there were two small cavities in the superior lobe, one at its apex, the other in the lower part of the lobe; there were no pleuritic adhesions on the left side; the left pleural sac contained about five ounces of serum; there was a deposit of tubercles in the posterior portion of the left lung, which, however, was not so abundant as in the right lung. The heart was rather small, but healthy. The spleen was healthy. The liver a little enlarged, but otherwise healthy. The right kidney was pale and large, the left healthy. The solitary follicles of the colon were prominent, and there were a number of small ulcers in the colon and rectum. The mesenteric glands were slightly enlarged.—Acting Assistant Surgeon David L. Haight. [Nos. 405 and 406, Medical Section, Army Medical Museum, are from this case. No. 405 is a section of the upper and middle lobes of the right lung, presenting a considerable number of discrete cheesy tubercles of moderate size. No. 406 is a portion of the descending colon, presenting numerous follicular ulcers, in many of which the swollen solitary follicles remain as prominent points in the centres of the ulcers, which extend circularly around them.]

CASE 311.—Private Arnold Wick, company H, 93d New York volunteers; admitted September 9, 1864. Chronic dysentery. [The register of the depot hospital of the 6th Corps shows that this man was admitted to that hospital August 11th—remittent fever—and sent to general hospital September 8th.] The passages were not very numerous at first, but the patient speedily became emaciated, and the stools ultimately very frequent. After a time he was attacked with cough and slight expectoration, but these symptoms were not very troublesome till within a day or two of his death, which took place October 17th. *Autopsy:* Body excessively emaciated. The posterior portion of both lungs was engorged with blood, and heavy enough to sink in water. The whole small intestine was greatly inflamed. Peyer's patches were somewhat prominent, and one, close to the ileo-cæcal valve, was ulcerated; the adjacent solitary glands were enlarged to the size of canary-seed. The large intestine was much thickened, and extensively ulcerated throughout its whole extent. The mesenteric glands were enlarged. The kidneys congested.—Acting Assistant Surgeon Henry Gibbons, jr.

CASE 312.—Private Isaac Shadwick, company H, 17th Vermont volunteers; admitted from the army of the Potomac September 9, 1864. Chronic dysentery. [The register of the depot hospital of the 9th Corps, City Point, Virginia, shows that this man was admitted to that hospital August 21st, and sent to general hospital September 8th; no diagnosis recorded.] Died, October 28th. *Autopsy* seven hours after death: No rigor mortis; body very much emaciated. The lungs, liver, kidneys, and spleen were normal. The small intestine and the greater part of the colon were healthy. The upper portion of the rectum was reddened, and presented numerous spots of ecchymosis; the lower two-thirds of the rectum were thickened, very dark-colored, and were the seat of numerous deep ulcers, most of which had penetrated through the mucous coat and several through the muscular coat; a large ascaris lumbricoides escaped from the intestines whilst a stream of water was being passed through them, so that it was impossible to ascertain from what portion it came. The bladder was distended with dark-colored urine.—Acting Assistant Surgeon Carlos Carvallo.

CASE 313.—Musician John Orleman, company C, 10th New York volunteers; age 16; admitted from City Point, Virginia, September 9, 1864. Typho-malarial fever. The patient was exceedingly weak when admitted. September 12th: There was some delirium and diarrhœa. Tonics and stimulants were administered, with the effect of decreasing the stools to one or two daily until September 29th, when dysentery set in and resisted treatment. October 19th: Well-marked symptoms of pneumonia on both sides were developed. Died, October 28th. *Autopsy* twelve hours after death: There were pleuritic adhesions on both sides posteriorly. The lower lobes of both lungs were hepatized. The liver and spleen were of normal size, but a little paler than natural. The small intestine was healthy. There was extensive thickening and ulceration of the colon and rectum, with considerable constriction of the latter, especially in its middle.—Acting Assistant Surgeon George P. Hanawalt.

CASE 314.—Private Abner H. Mundie, company G, 31st Maine volunteers; admitted from the army of the Potomac September 9, 1864. Chronic diarrhœa and bronchitis. [The register of the depot hospital of the 9th Corps, City Point, Virginia, shows that this man was admitted to that hospital August 14th—debility—and sent to general hospital September 8th.] From the date of admission the patient was somewhat flighty, continually desiring to explain his disease. He was much emaciated and very weak. Vomiting occurred several times; it was sometimes brought on by a paroxysm of coughing. The abdomen was very flat, somewhat painful on pressure; the stools thin and frequent; the tongue moist; pulse very feeble and thready. Died, September 16th. *Autopsy:* The lungs were much shrunken and engorged hypostatically; the ramifications of the bronchi were filled with a frothy fluid. The heart was firmly contracted and healthy. The liver was small and very green both superficially and deeply; the gall-bladder was full of very green bile. The spleen and kidneys were softened. The stomach contained three or four ounces of a dark-greenish fluid; its mucous membrane was softened. The small intestine was normal. The large intestine was thickened, and presented numerous follicular ulcers and some patches of pseudomembrane.—Assistant Surgeon William Thomson, U. S. A. [Nos. 393 and 394, Medical Section, Army Medical Museum, are from this case. No. 393 is a portion of the ascending, No. 394 of the transverse, colon; both present numerous follicular ulcers, one of several lines in diameter. The mucous membrane is thickened, and presents, in No. 394, a number of small patches of adherent pseudomembrane.]

CASE 315.—Private Philip Becker, 27th New York battery; admitted from the army of the Potomac September 9, 1864. Chronic diarrhœa. [This man appears on the register of the depot hospital of the 9th Corps, City Point, Virginia, as admitted August 31st—chronic diarrhœa; no disposition recorded.] He stated that he had been sick a long time; did not know exactly how long, but thought it was more than two months. He had lost a great deal of flesh, and was hardly more than skin and bones; had twenty to thirty passages in the twenty-four hours, consisting of yellowish, thin, flocculent matter; his pulse was feeble and about 100. Ordered a pill containing half a grain of nitrate of silver, three times daily, and laudanum enemata. After the first three days he began to improve, and the stools were reduced in number to three or four daily. He died very suddenly and unexpectedly, September 17th. *Autopsy* eighteen hours after death: The colon and rectum were extensively ulcerated, the mucous membrane hanging in fringes; the ulcers in some places had so nearly penetrated all the coats that they tore in removing the gut, although the greatest care was used. The small intestine was not much diseased. The lower Peyer's patches presented the appearance of the shaved-chin, and the neighboring solitary glands were slightly prominent. The other organs were all examined, but nothing abnormal was observed.—Acting Assistant Surgeon David L. Haight. [Nos. 364 to 366, Medical Section, Army Medical Museum, are from this case. No. 364 is from the ascending, No. 365 from the transverse, and No. 366 from the descending, colon, just above the rectum. All the specimens present extensive ulcers, which are fewest in No. 364 and most numerous and extensive in No. 366. The ulcers penetrate to the muscular coat, and appear to have extended by burrowing in the submucous connective tissue; as a consequence, the mucous membrane hangs out in more or less extensive fringes, which are especially remarkable in No. 366.]

CASE 316.—Private Daniel McDonald, company F, 39th Massachusetts volunteers; admitted from the army of the Potomac September 9, 1864. Chronic dysentery. He stated that he had suffered from frequent attacks of diarrhœa during the summer, and that for the last three weeks he had been in field hospital with a severe attack of dysentery. During the summer

he also had an attack of intermittent fever. [This man appears on the register of the hospital of the 1st Division, 2d Corps, as admitted August 9th—diarrhœa; no disposition is recorded. He is borne on the register of the depot hospital of the same division, City Point, Virginia, as admitted August 13th—intermittent fever—sent to general hospital September 8th.] He is now emaciated and feeble; conjunctivæ tinged with yellow; tongue furred; pulse 80. The abdomen is flat and tender to the touch, especially over the transverse and descending colon; he has also a slight bronchitis. His dysentery was partially controlled by astringents and a proper diet, and he was apparently doing well until September 29th, when he was seized with nausea, vomiting, and increased tenderness in the abdomen. From this time he sank rapidly, his pulse became feeble, his skin cool, and he died September 30th, at 10 A. M. *Autopsy* four hours after death: Rigor mortis well marked. Both lungs were firmly adherent to the sides of the thorax; their apices presented several dense fibrinous bands resembling cicatrices, and contained a number of cretefied tubercles, some of which were quite hard, others of a more cheesy consistence. The heart was healthy. The external surface of both large and small intestine was covered with a yellow croupous lymph, beneath which the peritoneum was slightly reddened. The recto-vesical cul-de-sac was filled with a thin yellowish-green pus, and there was a patch of lymph of considerable size on the fundus of the bladder. The small intestine was normal, except that a large cul-de-sac projected from the ileum, opposite its mesenteric attachment, about sixteen inches above the ileo-cæcal valve. The large intestine was much thickened, and presented both follicular ulcers and extensive ragged erosions; the ulcers were very irregular in size and shape, and were most extensive and numerous near the rectum. The liver, spleen, and kidneys were healthy.—Assistant Surgeon William F. Norris, U. S. A.—[No. 400, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon, which presents a few follicular ulcers and a number of somewhat extensive erosions.]

CASE 317.—Private Lewis W. Kopp, company H, 48th Pennsylvania volunteers; admitted September 9, 1864. Chronic diarrhœa and pleurisy. [This man appears on the register of the field hospital of the 2d Division, 9th Corps, as admitted August 21st—diarrhœa—sent to hospital August 27th. He is borne on the register of the field hospital, 9th Army Corps, City Point, Virginia, as admitted August 27th—typhoid fever—sent to general hospital September 8th.] He stated that he had been unable to do duty for several weeks on account of a bad cough and diarrhœa. He had a hacking cough but no expectoration, and a troublesome diarrhœa; was much emaciated; had severe night-sweats; pulse about 90; and the brilliant eye of a patient with hectic fever. Respiration was rude on both sides, and percussion quite flat on the right side posteriorly. He says phthisis is hereditary in his family. The symptoms continued with but little change until the 27th, when, toward nightfall, he was suddenly seized with a feeling of great oppression and became quite unable to keep the horizontal position. This feeling passed off in a few hours, but returned with great violence on the morning of the 30th; he rapidly sank, and died during the evening of the same day. On testing the urine by heat and nitric acid it became almost solid from excess of albumen. *Autopsy* fourteen hours after death: The right lung was congested but healthy; in the left pleural cavity there was a large effusion of a greenish-yellow sero-purulent fluid, which had completely compressed the lung against the vertebral column; both lung and costal pleura were coated with a thick layer of lymph. The heart was covered with a layer of fibrinous lymph, and there was in the pericardium a considerable effusion of serum in which shreds and flakes of lymph floated free. The liver was healthy, but adherent to the diaphragm; the adhesions were old and tough. The spleen was contracted and firm. The ileum presented a few ulcers. The large intestine was thickened and ulcerated throughout its entire extent. The left kidney was healthy; the right kidney was situated over the second lumbar vertebra, completely atrophied, and converted into a large cyst containing several ounces of a clear amber-colored liquid,—a patulous ureter led from it and emptied into the bladder at its usual place.—[Nos. 361 and 362, Medical Section, Army Medical Museum, are from this case. No. 361 is the bladder, right kidney, and bifurcation of the aorta. The kidney is converted into a cyst the size of an orange, with fibrous walls about four lines thick. The cyst is connected by a patulous ureter with the urinary bladder. Two renal arteries the size of crow-quills proceed from the aorta just above its bifurcation and ramify in the walls of the cyst. No. 362 is a portion of the thickened colon, the mucous surface of which presents numerous superficial ulcers resembling those produced by the irregular separation of a diphtheritic layer.]

CASE 318.—Private John F. Bell, company I, 8th New York heavy artillery; admitted from City Point, Virginia, September 9, 1864. Chronic diarrhœa. The patient was much emaciated, and had at the time of admission as many as twelve or fifteen passages in the twenty-four hours. The disease yielded to treatment about the latter part of September, after which, under the use of stimulants, he gained strength rapidly. October 17th: He had a relapse which proved uncontrollable. He died, October 22d, rather suddenly, having a pulse of natural frequency though feeble, and appearing tolerably strong until a few hours before death. *Autopsy:* The colon was thickened and presented numerous follicular ulcers, with some pseudomembrane adhering to the mucous membrane between them. [The condition of the other organs is not recorded.]—Acting Assistant Surgeon R. B. Hitz. [No. 462, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the descending colon just above the sigmoid flexure, presenting great numbers of minute follicular ulcers, between which the mucous membrane is frosted with pseudomembrane.]

CASE 319.—Private Robert Haller, company B, 7th New York volunteers; admitted from the army of the Potomac, September 9, 1864. Chronic diarrhœa. [This man appears on the register of the hospital of the 1st Division, 2d Army Corps, near Petersburg, Virginia, as admitted August 30th—fever—thence he was transferred to the depot hospital of the same division at City Point, Virginia, to which he was admitted September 6th—remittent fever—sent to general hospital September 8th.] Died suddenly, at a drinking saloon near the hospital, January 20, 1865. *Autopsy* sixteen hours after death: Rigor mortis well-marked; feet and legs slightly œdematous; several ecchymosed spots on the legs; slight ecchymosis and a cut on the bridge of the nose, caused apparently by a fall shortly before death; a similar bruise, but no cut, on the forehead. The brain and its membranes appeared to be healthy; the ventricles were full of colorless serum, and there was a moderate quantity of similar fluid in the subarachnoid space. Both lungs were firmly adherent to the thoracic parietes, but otherwise healthy, except that in the lower lobe of the right lung there was a pneumonic patch about three inches in extent, and a small abscess, with ragged walls, about half an inch in diameter. The larynx and bronchial tubes were healthy. The bronchial glands were enlarged, and black

both externally and on section. The œsophagus was normal. Several firm fibrinous bands connected the walls of the heart with the pericardial sac; there was quite an amount of fat on the external surface of the heart; the left ventricle contained a small clot, the other cavities were empty; the mitral valve was slightly thickened, the other valves were healthy; the muscular tissue of the heart was firm; the aorta was healthy. The liver was dark-red, firm, its acini distinct; the gall-bladder contained about an ounce of thin orange-yellow bile. The spleen was healthy. The stomach was full of half-digested meat and vegetables; it appeared to be healthy. The small intestine was healthy. All the coats of the large intestine were thickened. The mucous membrane was softened, and presented a few well-marked ulcerations. The kidneys were slightly fatty; the bladder contracted and empty.

Case 320.—Private James F. Ward, company C, 21st Pennsylvania cavalry; admitted September 9, 1864. Chronic diarrhœa. [The register of the hospital of the 1st Division, 5th Corps, near Petersburg, Virginia, shows that this man was admitted to that hospital August 29th—diarrhœa—and sent to depot hospital September 2d. According to the register of the depot hospital of the same division he was admitted to that hospital September 3d—remittent fever—and sent to general hospital September 8th.] This man, besides the usual symptoms of chronic diarrhœa, manifested slight aberration of mind for some time. He had an almost continual disgust for food, and became ultimately extremely emaciated. Died, January 22, 1865. *Autopsy* fifteen hours after death: No rigor mortis; excessive emaciation. The brain appeared to be quite normal, as did also the lungs and the heart. The liver was normal. The spleen was somewhat smaller than natural, but its texture normal. The kidneys were small and slightly fatty; the bladder was contracted, and contained a small quantity of urine. The small intestine was nearly healthy throughout, the only thing abnormal being some slight patches of congestion in its lower portion. The large intestine was thickened, and presented on its mucous surface numerous small, dark-colored oval ulcerations, many of which penetrated to the muscular coat. These ulcers were found in all parts of the large intestine from the cæcum to the rectum.—Acting Assistant Surgeon George P. Hanawalt.

Case 321.—Private John Morbly, company F, 180th Ohio volunteers; age 22; admitted February 5, 1865. Diarrhœa and pneumonia. This man had watery, offensive stools; feeble, rapid pulse; dusky, anxious countenance; labored respiration; dry, dark, thickly coated tongue; low delirium, and considerable stupor. There was marked dulness on percussion over the left side of the chest, but with little crepitation; on the right side small crepitation was heard. The expectoration was scanty and difficult at first, but was fairly established under the use of a combination of fluid extract of ipecacuanha, bicarbonate of soda, and sulphate of morphia. Stimulants and beef-tea were administered from the first. Died, February 7th. *Autopsy* sixteen hours after death: The superior lobe of the right lung was found to be completely consolidated, while the middle and lower lobes were collapsed and but slightly engorged. The superior lobe of the left lung was apparently healthy, and the upper third of the lower lobe was hepatized; the remaining portion was but slightly congested, and readily floated in water. The other organs of the chest were apparently healthy, and nothing abnormal was observed in any portion of the intestinal canal.—Acting Assistant Surgeon George P. Hanawalt.

Case 322.—Sergeant-major George Nichols, 5th United States cavalry; admitted from Winchester, Virginia, January 18, 1865. Chronic diarrhœa. This patient had suffered from diarrhœa for a year. At times the symptoms were very severe, at other times he had but three or four stools in the twenty-four hours. At present the stools are bloody, and accompanied by tormina and tenesmus. He is greatly debilitated, and had upward of thirty-six scanty stools in the last twenty-four hours. An aperient of castor oil was prescribed, to be followed by quarter of a grain of nitrate of silver and one grain of sulphate of quinia every four hours; also an injection of twenty drops of laudanum in thin starch-water three times a day. Stimulants were also prescribed. January 21st: The stools have diminished to eight or nine daily. The patient complains of a cough, which he says he has had for some time; the sputa are thin and yellow. An expectorant mixture was prescribed. January 22d: He complained of external piles; applied an ointment containing tannic acid. January 24th: Complained of weakness in the back; applied a pitch plaster. January 26th: Ordered tincture of the chloride of iron three times daily. February 5th: Has eight or nine passages in the twenty-four hours; is still much debilitated. ℞. Persulphate of iron fifty grains, peppermint water one ounce. Take thirty drops four times a day. February 10th: There is slight fever and headache, for which a diaphoretic was prescribed. February 12th: Symptoms of acute pleurisy set in. Died, February 14th. *Autopsy* twelve hours after death: Body emaciated; rigor mortis well developed. The left lung was collapsed, but connected to the thoracic parietes, and especially to the diaphragm, by pleuritic adhesions; the left pleural sac contained upward of thirty-two ounces of thin yellow serum in which clots of coagulated lymph floated; the superior lobe of the left lung was healthy, its inferior lobe somewhat hepatized; there were slight recent pleuritic adhesions on the right side. The apex of the upper lobe of the right lung contained tubercular deposits; the rest of the lung was healthy. The colon was ulcerated. The other organs were not examined.—Acting Assistant Surgeon Carlos Carvallo.

Case 323.—Private Samuel B. Turner, company B, 124th Indiana volunteers; age 20; admitted February 5, 1865. Chronic diarrhœa and consumption. This man had suffered from diarrhœa for ten months; he had, when admitted, from four to six stools daily; was much emaciated; had cough and night-sweats. The number of stools was soon reduced to two in the twenty-four hours; but little change was noted in his general condition till about April 1st, when he had an attack of coryza, soon after which the other symptoms became more serious and he was obliged to go to bed. About the 15th of April epistaxis occurred of such a character as to necessitate tamponing the nostrils. Died, April 22d. *Autopsy:* Body excessively emaciated. Both lungs were filled with softened tubercles; the upper lobe of the right lung was honeycombed with small vomicæ; in the apex of the left lung was a large vomica; there were strong pleuritic adhesions on both sides. The bronchial glands were greatly enlarged. The heart was normal; but the pericardium contained eight ounces of clear serum, and several small spots of ecchymosis were noticed beneath the serous membrane. The spleen and kidneys were normal. The liver was large, and near its anterior border there were two small masses of tuberculous matter. There was extensive ulceration of the intestines from the

duodenum to the rectum. Peyer's patches and the solitary glands, especially, were ulcerated; some of them, not yet ulcerated, appeared to be the seat of tubercular deposits. The mesenteric glands were excessively enlarged, and of a light-yellow color.—Acting Assistant Surgeon Henry Gibbons, jr.

CASE 324.—Private James Partington, company E, 1st Delaware volunteers; age 39; admitted July 14, 1865. Chronic diarrhœa. This patient came from Soldiers' Rest, with the information that he was supposed to be insane. He was in fact partly delirious, a condition which continued until death. He complained of no pain, prayed permission to go to a boarding house, and constantly asked for port wine. He was greatly emaciated; was very thirsty; his tongue parched; pulse feeble and frequent. He exhaled a very fetid odor. Died, July 20th. *Autopsy:* Near the sagittal suture the skull was very thin and translucent over four depressions corresponding to enlarged Pacchionian glands. The brain appeared to contain more blood than normal. The small intestine was pale. The solitary follicles of the large intestine were enlarged, with a darkened areola and a black dot in the centre of each. The spleen was small and soft. The other organs were apparently healthy.—Acting Assistant Surgeon Carlos Carvallo.

CASE 325.—Private Wyatt Perkins, company I, 37th Wisconsin volunteers; admitted July 25, 1865, at about nine o'clock P. M. Chronic dysentery. [According to the register of the hospital of the 1st Division, 9th Army Corps, this man was admitted to that hospital July 18th—acute dysentery—and sent to general hospital July 25th.] The patient was moribund; pulse very weak and fluttering; delirium; hiccough. Died, July 26th, early in the morning, about six hours after admission. *Autopsy* eight hours after death: The stomach was distended and inflamed, especially near the pylorus. The pyloric orifice was contracted. The small intestine was nearly healthy. The large intestine was excessively thickened, and presented on the surface of its mucous membrane a number of irregularly oval sloughs from half an inch to an inch in their long diameter, which were arranged transversely to the gut; these sloughs seemed to occupy nearly the entire thickness of the intestine; the peritoneum alone remained intact. The transverse colon was firmly adherent to the liver. The gall-bladder contained two gall-stones the size of ordinary marbles.—Acting Assistant Surgeon Henry Gibbons, jr.

CASE 326.—Private William Koppen, company C, 7th New York volunteers; age 20; admitted June 5, 1865. Chronic diarrhœa. This man was excessively emaciated, and had severe onyehia on several of his fingers and toes. He had typhoid symptoms, such as stupor, loose bowels, and sordes on the teeth; very little fever. Treatment: Tonics and nourishing food. June 27th: Cod-liver oil in porter. July 1st: Severe diarrhœa set in. The former remedies were then discontinued, and two grains of quinine directed thrice daily, with tincture of the chloride of iron every four hours; also milk and lime-water ad libitum. Subsequently quarter of a grain of nitrate of silver and half a grain of opium every four hours. At times the patient complained of excessive pain in the upper third of the left thigh, but could move the hip-joint on the affected side without any pain or inconvenience. July 11th: An abscess was detected in the anterior portion of the left thigh, about three inches below the anterior superior spinous process of the ileum. July 13th: Assistant Surgeon William F. Norris, U. S. A., opened the abscess, evacuating a quantity of thin fetid pus. ℞. Citrate of iron and quinia, four grains, three times daily; an ounce of sherry wine every three hours. In the evening there was high fever and profuse perspiration. July 16th: The discharge still continues: the fever and sweating have increased. July 21st: ℞. Aromatic sulphuric acid, five drops, every three hours. July 23d: The diarrhœa is worse. July 26th: Had eight stools in the last twenty-four hours, accompanied by dysenteric symptoms. July 28th: Is losing strength; countenance sharp; profuse perspiration. July 29th: Ten stools. August 1st: Delirious. Died, August 3d, at 3.30 A. M. *Autopsy* ten hours after death: Body excessively emaciated. The abscess was found to extend to the exterior of the capsule of the left hip-joint. There were slight pleuritic adhesions on both sides, apparently of recent date. The lungs were healthy. The liver fatty. The spleen enlarged and softened. The kidneys normal. Peyer's patches were very visible. The rectum was ulcerated, the ulcerations varying from the size of a pea to that of a large almond. The mucous membrane was thickened.—Acting Assistant Surgeon Carlos Carvallo.

CASE 327.—Private Arnold Gelhouse, company H, 37th Wisconsin volunteers; age 44; admitted from the field hospital of the 9th Army Corps, July 25, 1865. Chronic dysentery. In this case the most noticeable symptoms were distressing tenesmus and a very rapid pulse from the beginning. Eight grains of subcarbonate of bismuth and one of opium, to be taken every three hours, were ordered at first, but with little benefit. Opium suppositories were next resorted to, which somewhat lessened the pain and tenesmus, but did not check the frequency of the stools. Injections of nitrate of silver, two grains to the ounce of water, four times a day, were next directed, with some relief to the patient; but his strength gradually gave way, the abdomen became tympanitic, breathing labored, and he died, August 7th, at 12.30 A. M. *Autopsy* twelve hours after death: There were numerous old pleuritic adhesions on both sides. The lungs and heart were healthy. The spleen was of natural size, but quite soft. The small intestine was nearly normal. The large intestine was ulcerated from one end to the other; the mucous membrane of the rectum was almost entirely destroyed, only a few shreds remaining. Just below the sigmoid flexure there was a perforation half an inch in diameter; although there were no signs of fæces having escaped into the abdominal cavity, there was considerable peritonitis around the perforation and in the course of the colon generally.—Acting Assistant Surgeon George P. Hanawalt.

CASE 328.—Private William Mahar, company G, 10th United States infantry; age 19; admitted August 26, 1865. Diarrhœa. The patient was quite weak and pale. He stated that he had a chill two or three days previously, but none since. He had suffered from diarrhœa for some days, with from four to eight watery stools in the twenty-four hours. The order for his admission stated his disease to be typhoid fever, but no evidences of that disorder were observed. The pulse at his wrist counted 44, but an intermediate beat was heard over the heart; there was some slight abdominal pain, but no tenderness on pressure in the right iliac region; there was no delirium; his tongue was clean, moist, and slightly reddened; he complained of thirst. Ordered pills of nitrate of silver and opium, and a mixture of quinine and muriatic acid. August 28th: Pulse 64, heart-beat normal; the other symptoms are unchanged. The patient remains quite rational. August 29th: At 9.30 A. M. I was

called to see him, with the intelligence that he had a fit. I found him cold; his pulse weak; respiration infrequent; face pale; eyes wide open and turned upward; pupils very much dilated; corners of mouth twitching—*risus sardonicus*. I attempted to rouse him, and asked what is the matter? He replied, I don't know, and in a moment expired. Artificial respiration was attempted, with no result. *Autopsy* five hours after death: No rigor mortis. The lungs were healthy. The left side of the heart was firmly contracted, the right greatly distended with blood. The pericardium contained five or six drachms of serum. The liver, spleen, and kidneys congested, but otherwise normal. The mucous membrane of the intestines was inflamed, but not ulcerated. The mesenteric glands were enlarged. There were no indications whatever of typhoid fever, and no satisfactory evidence of the cause of death. [It does not appear from the record that the head was examined.]—Acting Assistant Surgeon Henry Gibbons, jr.

CASE 329.—Corporal William A. Harper, company K, 2d New York heavy artillery; age 31; admitted October 4, 1863. Chronic diarrhœa, from which he had been suffering two months and a half. The patient was very weak and emaciated, and suffered from almost constant nausea. He had ten or twelve liquid discharges daily. Stimulants, subcarbonate of bismuth, nitrate of silver, creasote, lime-water and milk, &c., were tried without success. The patient was unable to retain food or medicine, whether administered by the mouth or rectum. October 13th: He complained of pain in the left side of the chest, which was found to be dull on percussion; on auscultation large crepitation was heard. Carbonate of ammonia was prescribed, but was rejected. Flannel cloths saturated with turpentine and alcohol were applied to the chest, but with little effect. Died, October 21st. *Autopsy* fourteen hours after death: Rigor mortis well marked; body much emaciated. The brain was not examined. The left pleural sac contained about six ounces of fluid in which a few shreds of lymph floated; there were both old and new pleuritic adhesions on this side. The posterior two-thirds of the inferior lobe of the left lung was pneumonic; the superior lobe almost entirely healthy, as was the whole right lung. The liver was apparently healthy. The spleen small and hard. The kidneys were normal. The small intestine was inflamed and congested, with small patches of ulceration scattered over its mucous surface; the solitary glands seemed to be the seat of most of the ulcers; Peyer's patches were slightly engorged. The large intestine was inflamed but not ulcerated. The mucous membrane of the stomach near the pylorus was ulcerated, the ulcers resembling those of the small intestine.—Acting Assistant Surgeon George P. Hanawalt.

The next ninety-six cases are from the case-book of LINCOLN HOSPITAL, Washington, D. C.; Surgeon Henry Bryant, U. S. V., in charge from the date of the first case to May, 1863. After several temporary changes, Assistant Surgeon Roberts Bartholow, U. S. A., took charge from August 21st to December, 1863, when he was relieved by Surgeon J. Cooper McKee, U. S. A., who was still in charge at the date of the last case. In twenty-eight of the cases the autopsies were made and reported by Assistant Surgeon George M. McGill, U. S. A.; in thirty-nine, by Assistant Surgeon Harrison Allen, U. S. A.;* and in seventeen, by Acting Assistant Surgeon H. M. Dean.

CASE 330.—Private William S. Fetely, company B, 121st New York volunteers; admitted January 2, 1863. Typhoid fever. Died, January 12th. *Autopsy* six hours after death: The right lung was normal; the lower lobe of the left lung was in the state of gray hepatization; the upper lobe was congested; there was a considerable quantity of serous effusion in the left pleural cavity. The heart was normal, but contained a very large and tenacious clot. The small intestine was normal. The rectum was contracted and its walls were thickened. The liver was normal, except that in the inferior part of the left lobe there was a small calcareous deposit. The spleen was normal. The kidneys were large.—Assistant Surgeon George M. McGill, U. S. A.

CASE 331.—Private H. M. Foster, company A, 142d New York volunteers; admitted December 30, 1862. Typhoid fever. Died, January 13, 1863. *Autopsy* twenty-four hours after death: There were tuberculous deposits throughout the substance of the right lung, especially in its middle lobe, which was also much congested; the upper lobe of the left lung contained tuberculous deposits; the lower lobe was in the stage of red hepatization. The heart, liver, spleen, pancreas, and kidneys were normal. The jejunum and ileum were congested at irregular intervals, the congested portions being contracted and thickened. The descending colon was so much contracted that its caliber was less than that of the small intestine. The mesenteric glands were enlarged and tuberculous.—Assistant Surgeon George M. McGill, U. S. A.

CASE 332.—Sergeant Daniel W. Lyons, company K, 145th New York volunteers; age 21; admitted January 11, 1863. The first notes were taken January 14th. The diagnosis at that time was typhoid fever; the usual symptoms of that disease were present, and the patient was delirious at times. There was no perceptible change until January 17th, when he complained of a severe pain in his chest. On percussion slight dulness was detected over the lower lobe of the left lung, but nothing abnormal was discovered by auscultation. He had a slight cough, with rusty-colored expectoration. The treatment was at first stimulant; on the appearance of pulmonary symptoms an expectorant mixture was ordered, with counter-irritation over the seat of pain. Died, January 19th. *Autopsy* one hour after death: There was some effusion in the subarachnoid space and

* September 14, 1864, Dr. Allen presented to the Pathological Society of Philadelphia a brief "*Synopsis of Autopsies made at Lincoln General Hospital*," to which the reader is referred.—(Proceedings of the Pathological Society of Philadelphia, in the American Journal of the Medical Sciences, January, 1865, page 133.) In this paper he analyzes the appearances observed in forty-one cases of diarrhœa and dysentery, thirty-five of fever, twenty-one of pneumonia, and five of diphtheria. The notes of Dr. Allen's autopsies, from which the accounts here presented have been condensed, were not contained in the case-books of Lincoln hospital turned in to the Surgeon General's Office at the close of the war, but have since been copied into them from the originals, loaned for the purpose.

in the lateral ventricles. Strong adhesions were found on the anterior surface of the right lung; the right lung weighed eighteen ounces and a quarter, the left thirteen ounces and a half; the lower lobe of the left lung was congested hypostatically and presented a circumscribed region of hepatization; stellate spots of black pigment were scattered through the upper lobe. The heart weighed eight ounces and a half. The spleen weighed seventeen ounces and a half and was of a dark-purple color. The liver was pale and weighed seventy four ounces. The kidneys weighed five ounces and three-quarters each. Ulcerations were observed on the transverse rugæ of the jejunum. The colon was contracted. The mesenteric glands were greatly enlarged.—Assistant Surgeon George M. McGill, U. S. A.

CASE 333.—Private Hiram H. Ames, company G, 78th New York volunteers; age 37; admitted January 11, 1863. Chronic diarrhœa of some six months' standing. The patient was very weak and much emaciated; he complained but little; the stools averaged about six daily. Died, January 20th. *Autopsy* twenty-two hours after death: There was slight effusion in the subarachnoid space; the veins of the pia mater were full. The brain weighed fifty-four ounces. The right auricle and ventricle of the heart contained large, firm, white fibrinous clots; the left ventricle a small clot of the same character. Throughout the right lung there were circumscribed condensations of tissue, apparently the result of inflammation, presenting the features of red and gray hepatization; these varied from the size of a pea to that of a large walnut; when excised they sank in water; the left lung contained only one area of condensation, which was found in its upper lobe; both lungs were full of blood; they weighed nineteen ounces each. The liver was full of blood; it was firm and had a granular appearance; the gall-bladder was small, the bile dark and viscid. The spleen weighed four ounces and a quarter; the pancreas three ounces and a half. The left kidney weighed six ounces and a quarter, the right six ounces. The mesenteric glands were large. The stomach was irregularly congested, its mucous membrane soft. The mucous membrane of the middle third of the jejunum was slate-colored; the valvulæ conniventes of the jejunum indistinct. The mucous membrane of the lower third of the jejunum and of the ileum was reddened and very soft; the intestinal walls were extremely thin; just above the ileo-cæcal valve the redness was more intense, attaining a brilliant purple color, and some gray patches of pseudomembrane adhered to the surface. Large numbers of ulcers were found throughout the large intestine, some of them rather indistinct, others with very sharp edges; they were of very irregular form. The mucous surface of the rectum presented a honeycombed appearance, and was coated with gray pseudomembrane. The whole large intestine was thickened.—Assistant Surgeon George M. McGill, U. S. A. [Nos. 154 and 155, Medical Section, Army Medical Museum, are from this case. The specimens are two successive portions of the thickened colon, with adherent patches of pseudomembrane on the mucous surface and a number of follicular ulcers.]

CASE 334.—Private Michael Murray, company K, 1st United States artillery; admitted December 29, 1862. Chronic diarrhœa. The patient, when admitted, had also cough, thirst, and typhoid symptoms. January 12th: Troublesome hiccough set in. Died, January 20, 1863, at 6 P. M. *Autopsy* twenty-one hours after death: The brain weighed forty-six ounces and a half. The lower lobes of both lungs were congested posteriorly, and in parts could not be inflated; the right lung weighed twenty-three ounces, the left twenty-one ounces. The heart was empty, and weighed six ounces and a half. The liver weighed forty-two ounces; it was of a reddish-brown color and faintly mottled. The mucous membrane of the intestines was slate-colored and quite soft; in the ileum, cæcum, and ascending colon it was very thin; in the transverse and descending colon there were a number of ulcers. The rectum was not much diseased. The kidneys weighed five ounces and a half each.—Assistant Surgeon George M. McGill, U. S. A.

CASE 335.—Private Charles N. Blake, company B, 4th Vermont volunteers; admitted January 2, 1863. Chronic diarrhœa. Died, January 25th, at 8 A. M. *Autopsy* twenty-nine hours after death: Height five feet five inches; body somewhat emaciated; the abdomen was discolored, and there were purpuric spots on the front of the chest. The brain weighed fifty-two ounces; it was light colored and of normal consistence; the choroid plexuses pale; the pons and medulla congested; the sinuses of the dura mater full of coagulated blood; the subarachnoid space contained a considerable quantity of liquid. Both lungs contained miliary tubercles, and in places masses of cheesy tubercle, especially in the lower lobe of the left lung; in the same lobe there was a large cavity which communicated anteriorly with a bronchial tube of the third magnitude; the right lung weighed thirteen ounces, the left twenty ounces and a quarter. The heart weighed four ounces and a quarter; its muscular tissue had a somewhat gelatinous appearance; the right and left ventricles each contained a small clot; there was very little fat about the heart; the lining membrane of the aorta was reddened as far as its bifurcation; the bronchial glands were much enlarged, white internally, and contained pus in places. The liver weighed forty ounces; scattered throughout its substance were numerous miliary tubercles; the bile was dark colored and viscid; there was a considerable deposit of tuberculous matter upon the under surface of the diaphragm immediately above the right lobe of the liver. The spleen weighed seven ounces; it was of a light reddish-brown color, and contained numerous miliary tubercles. The right kidney weighed five ounces and a quarter, the left kidney five ounces; both kidneys contained tubercles, especially in their lower portions. The pancreas weighed two ounces. The mesenteric glands were slightly enlarged, and some of them were tuberculous. The stomach was large; its mucous membrane soft near the pyloric orifice. Numerous round, hard, small bodies were observed on the mucous membrane of the duodenum; some of them were translucent; the mucous membrane was of a pale purplish color. In the upper part of the jejunum was a small white body a line in diameter, which was surrounded by a reddish areola; other similar white bodies occurred farther down; Peyer's patches were dotted with black pigment; the solitary glands were enlarged and hard; the ileum was red, congested, and presented extravasations of blood into its mucous membrane. In the large intestine the mucous membrane was very thin, and there were several dark congested patches in the rectum.—Assistant Surgeon George M. McGill, U. S. A.

CASE 336.—Private Alpheus D. Northrup, company G, 37th Massachusetts volunteers; admitted January 2, 1863. Chronic diarrhœa. Died, January 28th. *Autopsy* ten hours after death: Height five feet ten inches; body greatly emaciated; the blood was fluid. The brain weighed forty-three ounces; it was of a light color and firm consistence; there were firm pleuritic adhesions on both sides. Both lungs were quite full of blood; the right lung weighed seventeen ounces and a half;

there was a slight deposit of tubercles in its upper lobe; the surrounding lung-tissue was tough and partially solidified; the inferior lobe was intensely congested and partly hepatized; portions sank in water. The left lung weighed thirteen ounces and a half; the posterior part of its lower lobe was in a state of atelectasis, and several of the lobules were consolidated. The heart weighed five ounces and a half; its substance was very flabby and of a deep-red color; the left auricle contained a small fibrinous clot; the other cavities were empty; the pericardium contained half an ounce of clear serum. The liver weighed thirty-five ounces and a half; it was full of blood, rather soft, and faintly mottled; the gall-bladder was small and filled with dark viscid bile. The spleen weighed three ounces and three-quarters; it was decidedly tough. The pancreas weighed two ounces. The right kidney was pale, and weighed three ounces and a quarter; the left kidney weighed four ounces and a quarter; the base of its pyramids was congested. The mucous membrane of the stomach was thin. There were several patches of congestion, almost resembling ecchymosis, in the lower portion of the jejunum; its mucous membrane was thin; in the upper part of the ileum the mucous membrane was thin and easily scraped off. On the mucous membrane of the upper part of the large intestine there were patches of a whitish exudation, which, farther down, covered the whole surface; still lower down there were numerous irregular, nearly circular, ulcers, surrounded by zones of white granular matter; the rectum was dark-colored, and presented numerous black spots in which were other ulcers; the adjacent surface was frosted with granules of white fibrinous matter.—Assistant Surgeon George M. McGill, U. S. A.

Case 337.—Private Alonzo D. Snow, company D, 137th New York volunteers; admitted from regimental hospital at Fairfax Station, Virginia, January 18, 1863. Chronic bronchitis. This patient was very much debilitated and had constant diarrhœa. Died, February 1st. *Autopsy* three hours after death: There was considerable post mortem rigidity, although the body was still warm. The brain weighed forty-six ounces and a half; there was a small quantity of pus in the lateral ventricles; the superficial veins were full of dark blood; the substance of the brain was of a dark color and soft. The right pleural sac contained about a pint of dirty yellowish liquid. The right lung weighed fifteen ounces and a quarter; its superior lobe was marked by a deposit of melanic matter following the course of the ribs; the middle lobe was congested anteriorly; scattered through the parenchyma of the lower lobe were a number of small irregular vomicæ containing a puruloid fluid; these cavities apparently did not connect with the bronchial tubes; in some cases bronchial tubes were found passing through them and surrounded by their contents without opening into them; the bronchial tubes contained a considerable quantity of frothy muco-pus; the left lung weighed twelve ounces and a quarter; there was some congestion in both lobes, and melanic matter in irregular patches at the apex. The pericardium was closely adherent to the surface of the heart. The tissue of the heart was firm and red; the right auricle was completely occupied by a dense black and white clot; in the right ventricle there was a pyramidal fibrinous clot, which extended into the pulmonary artery; the left ventricle also contained a small clot. The liver weighed fifty-eight ounces; it was of a uniform dark color externally, internally it approximated the nutmeg appearance; the gall-bladder was filled with very light watery bile. The spleen weighed six ounces and a half; it was somewhat softened and much congested; its color a very dark purple. The pancreas weighed two ounces and a half. The right kidney weighed four ounces and a half, the left kidney five ounces and a half. There was considerable softening of the mucous membrane through the whole alimentary tract, so that it tore with ease under the finger-nail. The ileum was congested at irregular intervals; the spots were at first of a light-orange color, which subsequently changed to a dark-brown. The large intestine was congested and its mucous membrane softened.—Assistant Surgeon George M. McGill, U. S. A.

Case 338.—Private C. R. Johnson, company B, 35th Massachusetts volunteers; admitted February 8, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 35th Massachusetts volunteers as admitted December 2, 1862—dysentery—returned to duty December 16th. He subsequently appears on the same register as admitted January 22, 1863—typhoid fever—sent to general hospital January 24th.] He walked into the ward carrying his knapsack, but appeared somewhat exhausted by the fatigue of the journey. During the afternoon he had several loose dejections, and one at midnight. He received ten grains of Dover's powder, and rested tolerably during the night. Next morning he complained of pain and soreness in the abdomen. The diarrhœa still continued. In the evening his symptoms were more urgent, the abdomen being somewhat tense and tender. Pills of blue mass and opium were prescribed. Died, February 10th, having just previously been out of bed to evacuate his bowels. *Autopsy* twelve hours after death: Height five feet seven inches; body not much emaciated; age apparently about 35 years; rigor mortis marked. The brain weighed forty-six ounces; it was of light color and normal consistence. The right lung weighed twenty-three ounces, the left eighteen ounces and a half; both lungs were congested and marked with pigment in bands corresponding to the ribs; a calcareous concretion was found at the apex of the left lung. The bronchial tubes were congested. The heart was firm and red; it weighed nine ounces and a half. The semilunar valves of the aorta were thickened and their adjacent edges adherent to each other. There was a large fibrinous clot in the right side of the heart, none in the left. The peritoneum was extensively inflamed. The liver weighed fifty ounces and a half; it was light colored, flabby, its acini distinct; the gall-bladder contained six drachms of very thick black bile. The spleen weighed three ounces and a half; it was soft, flabby, and of a dark-red color. The pancreas weighed two ounces and three-quarters; it was very light colored and firm. The right kidney weighed five ounces and a half, the left four ounces and a half; both kidneys were light colored and tough. The stomach was large. The valvulæ conniventes became indistinct in the lower portion of the jejunum, and the mucous membrane acquired a light slate color. The ileum was slate-colored and contracted. The colon was very much thickened and extensively ulcerated; one of the ulcers near the cæcum had perforated. The rectum was thick, soft, and readily torn, but not ulcerated. The bladder was hypertrophied.—Assistant Surgeon George M McGill, U. S. A.

Case 339.—Private David Fenstermaker, company K, 48th Pennsylvania volunteers; age 26; admitted from the hospital of the 2d Division, 9th Corps, Windmill Point, Aquia Creek, Virginia, February 8, 1863. Chronic diarrhœa, contracted at Fredericksburg. He had been sick a month, was emaciated, and had twelve to fifteen evacuations daily. His tongue was dry and brown, his features shrunken, and there was slight tenderness over the abdomen. ℞. Mercury with chalk, ten grains,

tannic acid two grains, quinine six grains; make eight pills. Take one every two hours. Half an ounce of brandy every hour. February 9th: Much the same; diarrhœa slightly less. February 10th: Diarrhœa worse again; stools involuntary. Died, February 11th. In this case the use of beef-tea seemed to aggravate the diarrhœa.—Acting Assistant Surgeon Daniel Weisel. *Autopsy* two hours after death: Height five feet ten inches; no rigor mortis; body somewhat emaciated. The brain weighed forty-eight ounces and a half; it was light-colored and soft; the pia mater was somewhat congested. The right lung weighed thirty-five ounces and a quarter, the left forty-eight ounces and a half; the right lung was congested throughout and presented a number of isolated hepatized lobules; the central portion of the upper lobe of the left lung and an irregular area in the lower lobe were also in the state of red hepatization; the rest of the lung was congested; the bronchial tubes on both sides were inflamed, the bronchial glands large and black. The heart weighed eight ounces and a quarter; its muscular tissue was firm and red; there was but little surrounding adipose tissue; the right cavities contained black clots which weighed an ounce and a quarter. The pericardium contained an ounce of serum. The liver weighed fifty-nine ounces and a half; it was firm, finely mottled, and generally congested; the gall-bladder contained a small quantity of light-yellow viscid bile. The spleen weighed eleven ounces and a quarter; it was of a dark-purple color, very firm and congested, its trabeculæ indistinct. The pancreas weighed two ounces and three-quarters; it was light-red and firm. The suprarenal capsules were normal. The right kidney weighed nine ounces, the left nine ounces and a half; the cortical substance of both kidneys had a peculiar light flesh color; their capsules were very readily torn off. The stomach was rather large, its mucous membrane soft. The mucous membrane of the small intestine was reddened; the valvulæ conniventes very distinct. The ascending colon was dark colored; its mucous membrane soft; its glands distinct and slightly enlarged; the transverse colon was contracted; its mucous membrane slate-colored, thin, soft, and presented a number of small ulcers; the descending colon was dilated; but, with this exception, presented the same appearances as the transverse colon. In the sigmoid flexure and rectum the ulcers were still larger and more numerous.—Assistant Surgeon George M. McGill, U. S. A.

CASE 340.—Private Alexander R. Bowser, company B, 139th Pennsylvania volunteers; age 26; admitted January 2, 1863. Diarrhœa. The patient had been sick ten days and was much reduced. The stools numbered eight to ten daily and were very thin and watery. He had no appetite; the tongue was dry; there was little or no abdominal tenderness. ℞. Blue mass thirty grains, ipecacuanha and opium of each two grains; make ten pills. Take one every two hours; on alternate hours ten grains of chlorate of potassa. Beef-tea, wine-whey, brandy. January 11th: The number of stools has been reduced to three or four daily, and are more consistent; the tongue is moister and shows some tendency to clean; the appetite has improved somewhat. January 22d: There are now two stools daily; the tongue is quite moist and clean. January 28th: The diarrhœa has returned with increased severity without any apparent cause. January 30th: The diarrhœa is no better; he complains for the first time of pain in the abdomen; the tongue is dry and brown; sordes on the teeth and gums. Typhoid fever was diagnosticated. Ordered stimulants and beef-tea to be given freely, also ten grains of chlorate of potassa every two hours. February 2d: The patient is much reduced; the diarrhœa but little better; the abdominal pain continues. Symptoms of pneumonia on the right side have made their appearance; there is considerable stupor, and he can scarcely be aroused to take nourishment. February 7th: There is great stupor; had fourteen involuntary stools last night. Died, February 13th, at 6.15 A. M.—Acting Assistant Surgeon Daniel Weisel. *Autopsy* fourteen hours after death: Height five feet eight inches; body emaciated and quite rigid. The brain weighed forty-nine ounces and a half; it was light colored and soft. The right lung weighed thirty-six ounces and a quarter, the left twenty-two ounces and a quarter; there were a number of cretefied tubercles in each; the middle lobe of the right lung was congested, the lower lobe hepatized, partly red, partly gray; the anterior portion of the upper lobe of the left lung was slightly congested, the lower lobe very much congested; there was but little black pigment in either lung. The bronchial tubes on both sides contained pus; their walls were thickened and the caliber of the tubes increased. The heart weighed seven ounces and a half; its muscular substance was pale; there was but little adipose tissue about it; there was a black clot in the cavities of the right side, a white fibrinous clot in those of the left; the clots weighed an ounce; the pericardium contained an ounce of fluid. The liver weighed sixty-two ounces and a quarter; it was of a light yellowish brown color and considerably mottled superficially, its acini indistinct; there were numerous peritoneal adhesions between the liver and the parietes of the abdomen; the gall-bladder contained a small amount of thick yellowish bile. The spleen weighed nine ounces and a half; it was of a dark brick-red color, tolerably firm, its trabeculæ distinct; like the liver it was firmly bound to the adjacent parts by peritoneal adhesions. The pancreas weighed two ounces and a half; it was light colored and firm. The suprarenal capsules weighed three-fourths of an ounce; they were large, red, and tough, with thick whitish borders and hard centres. The kidneys were firm and slightly congested; in the lower part of the right kidney was a small cyst. The urinary bladder was empty. The cardiac extremity of the stomach was slightly congested. The upper two-thirds of the jejunum were congested, its lower third blackened; in the latter portion the mucous membrane was thin and the valvulæ conniventes indistinct. The ileum was distended and slightly congested, its solitary glands enlarged; a number of patches of exudation of a grass-green color were observed in the ileum; they were arranged transversely to the length of the gut and parallel to each other; the lowest of them was three inches above the ileo-colic valve; it was quite granular in appearance; there were also a number of ulcers in the ileum which were surrounded by areas of congestion. The cæcum was intensely congested; its mucous membrane and that of the colon presented patches of pseudomembrane similar to those in the ileum, which increased in number and extent, until in the sigmoid flexure they formed an almost continuous coating to the mucous membrane. There were also a number of ulcers in the descending colon, sigmoid flexure, and rectum; many of them were coated with the pseudomembrane; when this was removed their bases were red and resembled granulations.—Assistant Surgeon George M. McGill, U. S. A.

CASE 341.—Private John Curdy, company E, 140th New York volunteers; admitted December 30, 1862. Typhoid fever. [This man appears on the register of the regimental hospital of the 140th New York volunteers as admitted November 15th—fever; no disposition recorded.] When the first notes were taken, January 24th, the patient was emaciated; pulse 95; severe cough; expectoration muco-purulent; bowels loose, three or four evacuations daily; appetite tolerably good. Treatment:

Nutritious diet, tonics, and astringents. Died, February 14th. His mind remained clear to the last. *Autopsy* three hours after death: Height five feet four inches; body somewhat emaciated; no rigor mortis; apparent age 28 years. The brain weighed forty-six ounces; it was of a light color and moderately firm. The right lung weighed twenty-eight ounces and a half, the left thirty-one ounces and a half; both were blackened externally by deposits of pigment, and contained abundant deposits of tubercles, many of which were softened; several large vomicæ were found in the upper lobe of each lung; the total capacity of these cavities was estimated at about twelve cubic inches; the remaining portion of the upper lobes was solidified. The bronchial tubes were congested, contained pus, and those leading from the solidified lobes were plugged with fibrinous exudation; extensive pleuritic adhesions, corresponding with the consolidated lobes, existed on both sides. The heart weighed seven ounces and a half; it was flabby and presented but little adipose tissue externally; the blood was fluid, but coagulated readily; the pericardium contained eight fluid drachms of a greenish-yellow fluid. The peritoneum generally was inflamed and slight adhesions had taken place. The liver weighed forty-eight ounces; it was of a dark brick-red color, firm, very faintly mottled, its acini rather indistinct; minute miliary tubercles were observed on its surface; the gall-bladder contained four drachms and a half of thin straw-yellow bile. The spleen weighed seven ounces and a half; it was of a blood-red color, firm, and contained miliary tubercles. The pancreas weighed three ounces and a half; it was of a light slate color and firm. The right kidney weighed four ounces and three-quarters, the left kidney four ounces and a quarter; both kidneys were firm and light colored; the right contained tubercles. The suprarenal capsules were of medium size, tough, and of an ochre color. The stomach was large; its mucous membrane thick and soft. The duodenal glands were enlarged. The mucous membrane of the small intestine was thin; the valvulæ conniventes indistinct, and disappeared in the lower part of the jejunum. The lower third of the ileum was congested, and the patches of Peyer in this region were ulcerated. Other ulcers, not seated in Peyer's patches, were situated as follows: In the upper part of the jejunum was a ragged ulcer, with a soft centre and raised sharply-defined edges; on the outside of the gut its situation could be detected by a moderately hard white ring corresponding to its internal edges. In the inferior third of the jejunum was a small ulcer on a raised base, surrounded by irregular congestion; viewed from the outside its situation was marked by a white spot. A similar ulcer, of medium size, occurred still lower down, and in the upper portion of the ileum were a number of small ulcers of the same general character. One ulcer in the lower third of the jejunum exhibited on the peritoneal surface a number of small white round masses supposed to be tubercles. The cæcum was congested and ulcerated, as was also the ascending and transverse colon; one large ulcer in the transverse colon measured two and a half by two inches; the mucous membrane of the rectum was slate colored; it presented a number of ulcers and some formations which were thought to be deposits of tubercle. The mesenteric glands were enlarged.—Assistant Surgeon George M. McGill, U. S. A.

Case 342.—Private Aaron Bridge, company F, 13th New Hampshire volunteers; admitted February 8, 1863. Chronic diarrhœa. Died, February 14th. The patient was comatose for several days before his death; just before he died, however, the coma disappeared, and he was able to converse quite rationally. *Autopsy* thirty-three hours after death: Height five feet six inches; body emaciated; rigor mortis slight; apparent age 55 years. The brain weighed fifty-two ounces and a half; it was firm and of a pinkish color. The right lung weighed fourteen ounces and a half, the left eighteen ounces; there were some calcareous concretions in both lungs; some of the lobules of the upper lobe of the left lung were in a state of gray hepatization; its lower lobe was congested; some of the bronchial tubes leading from the consolidated lobules contained pus, others were plugged with fibrin. The heart weighed nine ounces and a quarter; there were fibrinous clots on both sides, which, together, weighed an ounce and a quarter; the pericardium contained some reddish-brown serum. The liver was firm, its acini distinct; it weighed fifty-three ounces and a half; the gall-bladder contained about three ounces of thin dark-green bile. The spleen weighed six ounces and a quarter; it was of dark color and natural consistence; its trabeculæ were distinct. The pancreas weighed two ounces and a half; it was soft and yellowish. The right kidney weighed five ounces and a half, the left five ounces; both were light colored, firm, and lobulated; the bladder was full of urine. The stomach was distended, its mucous membrane congested. The duodenal glands were somewhat enlarged. The ileum was distended; in the upper third its mucous membrane was intensely congested; its solitary glands were large, and a dot of black pigment appeared in the centre of each; Peyer's patches were large in the lower third of the ileum; they were not generally diseased, but some of them presented small ulcers, which in no case, however, involved the whole patch; moreover, some of the Peyer's patches appeared healthy; some of the solitary follicles were ulcerated. The solitary glands of the colon were enlarged, and presented central dots of pigment; the descending colon was slightly congested.—Assistant Surgeon George M. McGill, U. S. A.

Case 343.—Private Henry Shomberg, company B, 54th New York volunteers; admitted February 19, 1863. Chronic diarrhœa. Died, February 22d, at P. M. *Autopsy* thirteen hours after death: Height five feet five inches; apparent age 28 years; body emaciated; some rigor mortis. A cleft palate was observed, and the cicatrix of an operation for hare-lip. There was a curvature of the spine to the left. The brain weighed fifty ounces; was light colored and of firm consistence. The right lung weighed thirteen ounces and three-quarters, the left eleven ounces; both lungs contained a large quantity of melanic matter, arranged externally in bands corresponding to the course of the ribs, internally following the blood-vessels; in the lower lobe of the left lung there was a calcareous mass the size of a pea; both lungs were congested. The heart weighed nine ounces and a half; there was much adipose tissue on its surface; two of the aortic valves were thickened and their free borders nodulated; on one of them was a firm red outgrowth the size of an apple-seed; on the anterior flap of the mitral valve there was an atheromatous patch; there were small white fibrinous clots in both ventricles; the pericardium contained a moderate quantity of fluid. The liver weighed sixty-two ounces and a half; it was pinkish-yellow, with indistinct acini, its capsule firmly adherent; the gall-bladder contained half an ounce of thin reddish-green bile; there were strong adhesions between it and the transverse colon. The spleen was light-brown and weighed nine ounces. The pancreas was pink, firm, and weighed three ounces and a quarter. The right kidney weighed eight ounces and a quarter, the left seven ounces and a half; each kidney contained a small cyst; the cortical substance of both was pale, the pyramids purplish-red. The stomach was irregularly congested, especially in its fundus; it was somewhat enlarged and its mucous membrane softened. The small intestine was somewhat dilated and very

thin, its mucous membrane quite soft. The solitary glands of the ileum were enlarged, conical, and white at their apices, several small dark-bordered ulcers, unconnected with Peyer's patches, were observed. The mucous membrane of the colon and rectum was congested; in the sigmoid flexure it was softened.—Assistant Surgeon George M. McGill, U. S. A.

CASE 344.—Corporal Hiram A. Scott, company A, 137th New York volunteers; age 23; admitted from regimental hospital, Fairfax station, Virginia, January 18, 1863. Typhoid fever. When admitted had frequent pulse, dry skin, and some cough. Dulness on percussion was observed on the right side of the chest. The expectoration was scanty at first, but subsequently became free. Died, February 2d. *Autopsy* fifteen hours after death: Height five feet seven inches; body emaciated; rigor mortis slight. The brain weighed fifty ounces; it was slightly congested and of a pale flesh color, its substance slightly softened; the subarachnoid space contained two ounces and a half of serum. The right lung weighed twenty-four ounces and a half, the left twenty-one ounces and a half; both pleural sacs contained serum, in all about three pints; both lungs contained much black pigment; the lower lobes of both were solidified, and the bronchial tubes leading to them inflamed. The bronchial glands contained much black pigment; three of them on the right side were somewhat enlarged. The heart weighed eleven ounces; firm white clots were found in both sides; they weighed two ounces. The liver weighed eighty-four ounces and a half; it was soft, and presented the nutmeg appearance; the gall-bladder contained six drachms of thin, dirty-yellow bile. The spleen weighed seven ounces and a half; was of a brick red color internally, and tolerably firm; on its surface was a white fibrous band, by which the organ appeared somewhat constricted. The pancreas was firm, weighed three ounces, and was of a light straw-color. The right suprarenal capsule was large, the left small; they were of a dark coffee-color and tough. The right kidney weighed five ounces, the left five ounces and a quarter. The stomach was slightly larger than usual; its mucous lining was somewhat softened. The mucous membrane of the small intestine was soft; the edges of the valvulæ conniventes congested. The large intestine was distended and congested throughout its whole length. The mucous membrane of the rectum was soft, much discolored, and covered with pseudomembrane. The mesenteric glands were enlarged.—Assistant Surgeon George M. McGill, U. S. A.

CASE 345.—Private Alonzo Russell, company C, 7th Wisconsin volunteers; admitted February 19, 1863. Consumption. [This man appears on the register of the hospital of the 1st Division, 1st Army Corps, Windmill Point, Aquia Creek, Virginia, admitted January 18th—chronic diarrhœa—sent to general hospital February 18th.] On admission this patient was extremely exhausted. He was much emaciated, and complained of cough, and pain in both lungs and in the abdomen. The sputa were somewhat purulent, and mixed with blood. There was dulness on percussion below both clavicles, and mucous rales were heard on both sides of the chest. He had three or four loose evacuations daily; had but little appetite; the abdomen was tender on pressure. Stimulants and nourishing diet were directed. Died, February 25th.—Acting Assistant Surgeon E. E. Andrews. *Autopsy* sixteen hours after death: Height five feet eight inches; body emaciated, somewhat rigid; apparent age 28. The brain weighed forty-four ounces and a half; was light colored and soft. In two places, one on each side of the longitudinal sinus, the Pacchionian bodies had attained great size, producing absorption of the dura mater, internal table, and diploë. The right lung weighed seventeen ounces and a quarter, the left twenty-one ounces and a half; both were congested hypostatically; there was a tubercular deposit the size of a filbert in the anterior edge of the upper lobe of the left lung; another the size of a pea in the apex of the right lung. The bronchial glands were dark and hard. The heart weighed six ounces; it was firm, red, and contained no clots; the usual amount of adipose tissue was present. The pericardium contained an ounce of serum. The liver weighed thirty-six ounces; scattered through its substance were a number of miliary tubercles; two drachms of light-colored watery bile were found in the gall-bladder. The spleen weighed three ounces and a quarter; it was of a dark-brown color, firm consistence, and filled with tubercles. The pancreas weighed two ounces and one-eighth; it was dark colored and very firm. The suprarenal capsules were large and tough. The right kidney weighed four ounces and a quarter, the left four ounces and a half; they were very much congested. The stomach was congested almost to ecchymosis; its mucous membrane soft, the congestion and softening extending into the duodenum. The upper part of the jejunum was slate-colored; other portions of the intestinal mucous membrane were congested. The solitary and agminated glands were normal.—Assistant Surgeon George M. McGill, U. S. A.

CASE 346.—Private Ely Olp, company I, 137th Pennsylvania volunteers; admitted January 27, 1863. Chronic diarrhœa. This patient, when admitted, had ten or twelve evacuations daily; was extremely emaciated; tongue furred; pulse 89; no cough or expectoration noticed. Anodynes and astringents were given, which somewhat diminished the number of evacuations; the strength of the patient was supported by wine and ale; but the stools became very offensive and putrid, the appetite failed, and the patient gradually sank. Died, February 25th. *Autopsy* six hours after death: Height five feet five inches and a half; apparent age about 38 years; body much emaciated; no rigor mortis. The brain weighed forty-eight ounces and a half; it was of a light color, soft and flabby; there was but a small quantity of subarachnoid fluid. The right lung weighed thirteen ounces and a quarter, the left eleven ounces and a quarter; tuberculous deposits were found in all the lobes of both lungs, but especially in their apices; but little softening of these deposits had taken place; the surfaces of both lungs presented an excess of black pigment. The bronchial glands were large, firm, and black. The heart was firm, and weighed eight ounces; there was a large white clot in its right side, a mixed clot in the left; the clots weighed two ounces and a quarter. The pericardium contained six drachms of straw-colored serum. The mucous membrane of the œsophagus was softened and ulcerated for a space which extended from two inches below its commencement downward four inches; there were several separate ulcers, some of which were coated with a greenish disorganized substance. The liver weighed forty ounces and a half; it was mottled purple and white, the acini distinct; miliary tubercles were found in all parts; the gall-bladder contained two drachms of a watery light-brown bile. The spleen weighed three ounces and three-quarters; it was tough, firm, and light colored. The pancreas weighed three ounces and three-quarters; it was flesh-colored and firm. The suprarenal capsules were rather large, and together weighed a quarter of an ounce; they were of a dark coffee-color and tough; in the upper part of the left capsule there were two small cysts. The stomach was natural. The glands of the duodenum distinct. The mucous membrane of the upper third of the jejunum was black, that of the middle third green, the lower third greenish-red; the upper third of the ileum was congested;

the mucous membrane throughout the small intestine was soft; the solitary glands were swollen; Peyer's patches inflamed; within eight inches of the ileo-cæcal valve were a number of small light-colored ulcers with raised edges; the valve itself was blackened by pigment deposits. There was some congestion in the cæcum, but not much in the ascending colon; in the transverse and upper third of the descending colon there was irregular congestion, with ulceration, and deposits of pseudomembrane.—Assistant Surgeon George M. McGill, U. S. A.

Case 347.—Private M. H. Wray, company H, 135th Pennsylvania volunteers; age 35; admitted February 19, 1863. Diarrhœa. This patient was sent to field hospital in Virginia several months ago with œdema of the legs; subsequently he had an attack of measles, and this was followed by diarrhœa. When admitted he was extremely emaciated, complained of pain and tenderness over the abdomen; had frequent stools; pulse scarcely perceptible; skin cold and cadaverous; tongue moist and free from any fur; feet cold. Died, February 25th. Treatment: Blue mass and opium, Dover's powder, &c. Diet: Boiled milk, toast and tea, beef-tea, brandy. *Autopsy* nineteen hours after death: Height five feet nine inches; no rigor mortis. The brain weighed fifty-five ounces and a half; it was full of blood, and the vessels of the pia mater were injected. The right lung weighed twelve ounces and a half, the left eleven ounces; both lungs contained an excess of black pigment, and were congested hypostatically. The heart weighed seven ounces and three-quarters, and contained mixed clots which weighed two ounces. The pericardium contained two ounces of fluid resembling mucilage of acacia. The liver weighed thirty-eight ounces, was full of blood, of a reddish coffee-color and firm consistence, the acini indistinct; the gall-bladder contained two drachms of a very viscid and dark-green bile. The spleen weighed two ounces and three-quarters, was of a dark-red color and normal consistence; it contained a small nodule of cheesy matter. The pancreas weighed two ounces and a half. The suprarenal capsules were very small and tough. The left kidney weighed four ounces and a quarter, the right four ounces; they were both very dark colored and tough. The stomach was slightly congested in the fundus and toward the pyloric orifice; its mucous lining was soft. The duodenal glands were slightly enlarged. The valvulæ conniventes in the duodenum and jejunum were not well developed; the upper part of the jejunum was congested, the lower part of a light slate-color; the solitary glands were enlarged; the mucous membrane of the ileum was soft and deeply congested, but both the solitary glands and the glands of Peyer appeared to be normal. The mucous membrane of the cæcum was soft and dark colored. Congested patches were noticed at the splenic and sigmoid flexures of the colon; in the latter the mucous membrane was brownish-red. Assistant Surgeon George M. McGill, U. S. A.

Case 348.—Private Peter Manning, company B, 49th Pennsylvania volunteers; admitted February 19, 1863. Consumption. [This man appears on the register of the hospital of the 2d Division, 6th Corps, Windmill Point, Aquia Creek, Virginia, admitted January 20th—diarrhœa; no disposition recorded.] This patient was extremely emaciated and prostrate when admitted. He had a severe cough, with copious purulent expectoration; he was also suffering from diarrhœa, and had six or eight evacuations daily. His cheeks were flushed; pulse from 100 to 120; he complained of pain in both lungs, but especially in the left. Nourishing diet, wine, and anodynes were administered. Died, February 26th. *Autopsy* five hours and a half after death: Height five feet one or two inches; body much emaciated; rigor mortis marked; apparent age 30. The brain weighed forty-two ounces; it was light colored and quite firm; the veins of the pia mater were full of blood. The right lung weighed twelve ounces and a half, the left thirty-three ounces. The bronchial glands were large, soft, and black. The heart weighed seven ounces and a half; it was firm and dark-red; there was very little adipose tissue externally; there was a large, firm, black clot in the right auricle, and mixed clots in both ventricles; the clots weighed four ounces. The pericardium contained five ounces of purulent serum in which flakes of lymph floated. The liver presented the nutmeg appearance; it weighed fifty-nine ounces and a half; the gall-bladder was empty. The spleen weighed four ounces, was of a very dark-purple color and unusually firm. The pancreas was flesh-colored, firm, and weighed three ounces and a half. The suprarenal capsules were remarkably large, firm, and dark-brown internally. The right kidney weighed four ounces, the left four and a quarter; both kidneys were dark-red and firm. The fundus of the stomach was congested. There was an area of congestion in the middle of the jejunum, and patches of congestion in the ileum; the solitary follicles of the ileum were slightly enlarged, and two of Peyer's patches, one in the lower part of the jejunum, the other in the ileum, were thickened; the remaining Peyer's patches were healthy; in the vicinity of the thickened patches the intestine was contracted. There were a number of congested spots in the ascending and transverse colon. (The intestines were not examined until thirty-eight hours after death.)—Assistant Surgeon George M. McGill, U. S. A.

Case 349.—Private Addison Bowley, company C, 3d Vermont volunteers; admitted January 2, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 3d Vermont volunteers, excused from drill on account of diarrhœa, November 12, 1862, and again December 1st; in hospital with diarrhœa December 10th—sent to general hospital January 2d.] This patient had been suffering from diarrhœa three months. He was of scrofulous diathesis; about 30 years old; had large prominent blue eyes and dark hair. The action of his heart was violent, suggesting hypertrophy of that organ, and he complained of a sense of oppression in the præcordia. Pulse small, at times almost imperceptible; countenance cadaveric. Died, February 27th, at 7 P. M.—Acting Assistant Surgeon Henry F. Condict. *Autopsy* twenty hours after death: Height six feet; body very rigid; no emaciation. The brain weighed fifty-four ounces and a half; it was light colored and firm; there was an unusual quantity of serum in the subarachnoid space and in the ventricles. The right lung weighed twenty-five ounces, the left twenty-one; six pints of serum were taken from the pleural cavities; all the lobes of both lungs contained miliary tubercles, which were most abundant in their posterior portions; the lower lobes were hypostatically congested. The bronchial glands were tuberculous. The heart was soft, flabby, and weighed ten ounces; it was surrounded by a moderate quantity of adipose tissue; the heart-clots weighed one ounce and a quarter. The pericardium contained eight ounces of serum. The liver weighed eighty-seven ounces; it was of a brownish-purple color, mottled, its acini distinct, and had miliary tubercles on its surface; the gall-bladder was empty. The spleen weighed twelve ounces and a half; it was of a dark-purple color, and had miliary tubercles both on its surface and internally. The pancreas weighed three ounces and a quarter. The suprarenal

capsules were large, soft, and coffee-colored. The right kidney weighed nine ounces and three quarters, the left eleven ounces and a half; both of them were light colored, friable, and slightly congested inferiorly. The stomach was large, its rugæ prominent. The mucous membrane of the duodenum was congested and softened. There was irregular congestion of the lower fourth of the jejunum, and the whole of the ileum, alternating with slate-colored patches. The valvulæ conniventes were indistinct; the mucous membrane thin; the solitary follicles enlarged. The large intestine was dilated, its walls thin, its mucous membrane bluish and softened. There were several ulcers, each about the size of a three-cent piece, in the colon and rectum. On the peritoneal surface of the intestines were numerous miliary tubercles, which were particularly conspicuous in positions corresponding to the patches of Peyer.—Assistant Surgeon George M. McGill, U. S. A.

CASE 350.—Private John C. Claus, company B, 43d New York volunteers; admitted February 24, 1863. Chronic diarrhœa of four months' duration; he had also a gunshot wound of the left foot, received at Fredericksburg. He was exceedingly emaciated, and had from two to four loose stools daily. Died, February 28th.—Acting Assistant Surgeon Daniel Weisel. *Autopsy* thirty-eight hours after death: Height five feet six inches; no rigor mortis; body very much emaciated. The brain weighed forty-eight ounces and a half; it was firm, injected with blood, the ventricles full of serum; there were old pleuritic adhesions on both sides. The lobes of the lungs were interadherent; the right lung weighed eighteen ounces, the left sixteen; posteriorly all the lobes of both lungs were intensely congested. The bronchial glands contained a great deal of black pigment. The heart weighed five ounces and a half; it was soft and flabby; there was no adipose tissue about it. The pericardium contained no fluid. The liver weighed thirty-nine ounces; it was dark-brown, firm, its acini indistinct; the gall-bladder contained two drachms of reddish viscid bile and a gall-stone quarter of an inch in diameter. The spleen weighed three ounces and a quarter; it was purple, friable, intensely congested inferiorly, its trabeculæ indistinct. The pancreas was of a dark slate-color, and weighed one ounce and three-quarters. The suprarenal capsules were large, tough, and of a dark coffee-color. The kidneys weighed four ounces each; they were dark colored, tough, and congested inferiorly. The rugæ of the stomach were indistinct. The jejunum was of a reddish slate-color; in its middle third a few inches of the tube were extremely dilated and very thin; the ileum was deeply congested. There were numerous ulcers, varying from the size of a pin's head to that of a half dime, in all parts of the large intestine; they were largest and most abundant in the sigmoid flexure and rectum; these ulcers, in the colon, were chiefly arranged in rows corresponding to the longitudinal muscular bands; many of them penetrated to the muscular coat.—Assistant Surgeon George M. McGill, U. S. A.

CASE 351.—Private Smith Austin, company H, 33d New York volunteers; admitted February 20, 1863. Chronic diarrhœa. [This man appears on the register of the hospital of the 2d Division, 6th Army Corps, Windmill Point, near Aquia Creek, Virginia, admitted January 18th—diarrhœa; no disposition recorded.] He had been sick for five months. He was feeble, emaciated, his abdomen tender, and he had from six to eight loose passages daily. Ordered tonics and supporting treatment. February 26th: Symptoms of pneumonia in the right lung made their appearance. Died, March 2d, at 6 A. M.—Acting Assistant Surgeon Daniel Weisel. *Autopsy* eighteen hours after death: Height five feet seven inches; body emaciated; no rigor mortis. The brain weighed fifty-one ounces and a half; it was dark-gray and soft; the third and fourth ventricles contained an unusual quantity of serum; some sand-like granules were found in the pineal gland. The right lung weighed twenty-five ounces and a half, the left twenty-one ounces and a half; there were old pleuritic adhesions on both sides, which were very numerous on the left side; there was some lobular pneumonia in the posterior part of the middle lobe of the right lung, and a patch of red hepatization in the lower lobe; both these lobes were considerably congested, as was also the lower portion of the left lung. The bronchial tubes leading to the lower lobes of both lungs were also congested. The bronchial glands were of normal size but dark colored. The heart weighed nine ounces and a quarter, the clots three-quarters of an ounce; there was but a small amount of adipose tissue on the surface of the heart; there were several fibrous adhesions between the posterior wall of the left ventricle and the pericardium. The liver weighed forty-three ounces and a half; it was reddish-brown, tinged with slate-color, and quite firm; the gall-bladder contained nineteen drachms of yellowish, very viscid bile. The spleen weighed seven ounces; it was firm and of an irregular purplish slate-color, its trabeculæ well marked. The pancreas weighed two ounces and a half; it was firm and of a reddish slate-color. The suprarenal capsules were tough, light colored, and together weighed half an ounce. The kidneys were lobulated, and weighed four ounces and a half each; they were friable, slightly congested, and of a purplish-red color. The stomach was normal. The duodenal glands were large and distinct. The jejunum was quite thin, irregularly congested, and near the ileum dark slate-colored. The mucous membrane of the ileum was also slate-colored, and easily scraped off with the finger-nail. Peyer's patches were distinct and yellowish. There were a few ulcers in the cæcum and ascending colon, and a number of small black spots with whitish centres, which, when pressed, exuded a gelatinous substance; in the transverse colon there were numerous small ulcers with whitish borders, coated over with whitish lymph; there were also several ulcers in the sigmoid flexure and rectum.—Assistant Surgeon George M. McGill, U. S. A.

CASE 352.—Private Peter W. Homer, company F, 1st New Jersey cavalry; age 26; admitted January 2, 1863. Typhoid fever, contracted a month previously at Fredericksburg. The patient was very much reduced, emaciated, had an exhausting diarrhœa, from ten to twelve thin watery evacuations daily, and much abdominal tenderness. Was ordered tonics, stimulants, and nourishing diet. January 15th: Some slight improvement is noticed; there are but six evacuations in the twenty-four hours. January 20th: Diarrhœa still better. The abdominal tenderness is subsiding, but erysipelas has set in. The eruption extended over the face and a portion of the scalp, but disappeared in the course of a few days, after which the diarrhœa grew worse again, there being about ten evacuations daily. The patient became exceedingly weak, could be aroused with difficulty, and his death was almost hourly expected till February 2d, when he began again slowly to improve. By the 15th the evacuations were reduced to one or two daily; they were of greater consistence, and he began to gain appetite and strength. February 24th: Is not so well; ate no breakfast; the diarrhœa is again troublesome; tongue furred. February 25th: Pneumonia was recognized: there was much cough, pain in the chest, and rusty sputa. Died, March 2d, at 10 P. M.—Acting Assistant Surgeon Daniel Weisel. *Autopsy* twenty-six hours and a half after death: Height five feet five inches and a half; body rigid and emaciated. The brain

weighed forty-eight ounces; it was very firm, of a grayish color, its blood-vessels injected. The right lung weighed twenty ounces, the left seventeen and a half; there was but little pigment in either; the lower lobe of the right lung was hepatized; the middle lobe and the lower lobe of the left lung were affected by lobular pneumonia. The bronchial glands were of normal size and dark color. The heart weighed nine ounces and a quarter; was quite firm; there was but little adipose tissue about its base; there was a white fibrinous clot in the right auricle and ventricle, which extended into the pulmonary artery; in the left cavities there was a similar clot, which extended into the aorta; these clots weighed eight ounces and three-quarters. The pericardium contained five drachms and three-quarters of serum. The liver weighed fifty-two ounces; it was firm, irregularly mottled, its acini indistinct; the gall-bladder contained six drachms of greenish-brown viscid bile. The spleen weighed five ounces and a half; it was moderately firm, of a dark-red color; its trabeculæ were distinct. The pancreas weighed two ounces and a half; it was flesh-colored and firm. The suprarenal capsules were large, yellowish, and rather friable. The right kidney weighed six ounces and a quarter, the left eight ounces and a half; both were light colored but firm. The mucous membrane of the fundus of the stomach was red; near the pylorus slate-colored; its rugæ were distinct. The duodenum was slate-colored and stained with bile; the jejunum slate-colored and slightly congested; the ileum was dark-yellow and congested in places; its lower portion had a smooth ironed look. The large intestine was of a dark slate-color and congested; the fæcal matter in it had a peculiarly offensive odor.—Assistant Surgeon George M. McGill, U. S. A.

Case 353.—Private Charles E. Edgely, company F, 13th New Hampshire volunteers; age 21; admitted February 18, 1863. Chronic diarrhœa. Had been sick three weeks, the symptoms being debility, chills, cough, and diarrhœa. When admitted he was much emaciated, but slept pretty well, and had a good appetite. February 20th: Pneumonia supervened. He had a slight chill, and took to his bed complaining of cough and excessive weakness; subcrepitant rales were heard on both sides; after a few days the rales on the right side were replaced by puerile respiration, on the left side by bronchial respiration and bronchophony. Died, March 7th. *Autopsy* nine hours and a half after death: The body was very rigid and slightly emaciated. The brain weighed fifty-two ounces and a half; it was firm and of a flesh color. On section the puncta vasculosa were quite conspicuous; the pia mater was congested; the subarachnoid fluid abundant. The right lung weighed twenty-two ounces and a quarter, the left thirty-eight and a half; the lower lobe of the right lung was very much congested; its upper lobe contained a few consolidated lobules. The right bronchial tubes were congested. There were extensive old pleuritic adhesions on the right side. The lower lobe of the left lung was in a state of gray hepatization; its substance was friable, and exuded pus on pressure. Recent pleurisy was manifested by false membrane covering the whole surface of the lower lobe, most of the upper, and binding the lobes together. The bronchial tubes proceeding from the hepatized lobe were obstructed by white fibrinous plugs. The heart was firm, its valves normal; in its right side was a firm fibrinous clot which extended into the pulmonary artery; a similar clot in the left side extended into the aorta; in the left side there were also some black coagula. The pericardium contained an ounce of light greenish-yellow serum. The liver weighed seventy-four ounces and a half; it was congested, firm, its acini distinct; the gall-bladder contained ten drachms of light straw-colored bile. The spleen weighed fifteen ounces; it was quite firm, and of a dark-purple color with whitish spots. The pancreas weighed three ounces and a quarter; it was quite full of blood. The suprarenal capsules were small, of a light coffee-color, and soft. The right kidney weighed six ounces and a half, the left seven and a quarter; both were pale, but firm. There was some congestion in the stomach, the mucous membrane of which was soft. In the upper part of the jejunum the mucous membrane was congested and of a dark-purple color; below, the congestion was irregular, and regions of apparently healthy mucous membrane were observed. The ileum was congested and distended with gas. Peyer's patches were slightly thickened and injected. The mucous membrane of the cæcum had a dark-purple color; the ascending colon was but slightly congested, the transverse colon intensely so, the descending colon appeared healthy; the rectum presented the same dark-purple congestion which was observed in the cæcum.—Assistant Surgeon George M. McGill, U. S. A.

Case 354.—Private Jacob Giles, company E, 14th United States infantry; age 20; admitted December 30, 1862. Chronic diarrhœa. The first notes were taken January 6, 1863, when the patient had suffered from diarrhœa for five months. He had bloody discharges and was troubled with piles at times. He was quite weak, thin, and pale, and had a dark-red tongue. January 10th: There were but three passages during the last twenty-four hours, and they were more natural. The patient thinks himself better, but is very much emaciated. February 2d: Still appears to improve. Croton oil mixed with tartar emetic has been freely applied to his abdomen for several days; the skin is very sore, but the pustules are imperfectly formed. He has about two painless passages daily. His appetite is returning. He complains at times of pain in the left shoulder and in the region of the spleen. Subsequently to this date the patient grew steadily feebler, though the stools seldom exceeded two daily. Croton oil was applied to his abdomen a number of times, but the skin seemed possessed of a singular resisting power. He died March 13th. It may be mentioned that during the first three weeks after admission the treatment of this case consisted in the administration of an emetic dose of ipecacuanha three times daily. *Autopsy* thirty-seven hours after death: Height five feet five inches; rigor mortis slight; body very much emaciated. The brain weighed fifty-three ounces; it was darker colored than usual, very full of blood, and quite firm; the vessels of the pia mater were not remarkably full; the commissura mollis was absent. The right lung weighed sixteen ounces and a quarter, the left twenty and a quarter; the lower lobe of the left lung and the posterior portion of the upper lobe were in a state of congestion bordering on hepatization; portions of the lower lobe readily sank in water, and much puruloid fluid issued from the section on pressure. The bronchial tubes of these lobes were congested in transverse lines. The lower lobe of the right lung was hypostatically congested; the remaining lobes normal. The bronchial glands were of the usual size, and black internally. The heart was flabby; it weighed, unopened, seven ounces; there was no adipose tissue on its exterior, the right ventricle contained a thin fibrinous clot. The pericardium contained four drachms of milky serum. The liver weighed thirty-nine ounces and a half; it was light reddish-brown, firm, its acini distinct; the gall-bladder contained fourteen drachms of light-yellow bile. The spleen weighed three ounces; was light-red, and firm; its trabeculæ were marked. There was a very small supplementary spleen. The pancreas was flesh-colored, firm, and weighed two ounces. The suprarenal capsules weighed together three-quarters of an ounce; the substance of the left was ash-colored, the right mottled

dark-purple and white. The right kidney weighed five ounces and a quarter; the left five ounces and a half; they were light colored and firm. The mucous membrane of the stomach was normal, with the exception of a large patch of irregular congestion near the pylorus. The duodenal glands were large. The upper third of the jejunum was normal; in the middle third Peyer's patches were distinct; the mucous membrane presented irregular patches of arborescent congestion, and was frosted with pseudo-membrane; the same condition was observed in the ileum, which was more congested, and in its lower portion of a dark slate-color; Peyer's patches in the ileum had a mammillated appearance; the gut was very thin. In the cæcum and ascending colon the mucous membrane was brownish-red, and the granulated pseudomembranous frosting continued; in the transverse colon the pseudomembrane occurred in larger patches, which, when scraped off, exposed a reddened and abraded surface; farther down the patches became still larger, and covered a great portion of the surface; in the rectum, when the false membrane was removed, a blackish ulcerated base was found; two inches above the anus were three ulcers, each about one-third of an inch in diameter, with sharply cut edges, which extended to the muscular coat. The mesenteric glands were large and soft.—Assistant Surgeon George M. McGill, U. S. A.

Case 355.—Private William Allerdist, company D, 20th New York volunteers; German; admitted January 2, 1863. Chronic diarrhœa and anasarca. Died, March 16th. *Autopsy* twenty hours after death: Height five feet four inches; body slightly emaciated; apparent age 28. The brain weighed fifty ounces and a quarter; there was some effusion in the sub-arachnoid space; in other respects the brain was healthy. The heart was small; it had very little adipose tissue about it; the valves were normal; the right side was filled with black clots. The pericardium contained a moderate quantity of fluid. Both lungs contained a considerable number of whitish cheesy tubercles; in the apices of their upper lobes these were surrounded with a considerable quantity of melanic matter; the lower lobes were congested and purplish on section. The bronchial tubes were congested and dilated; the larger tubes filled with a frothy mucoid serum. The right lung weighed twenty-two ounces and a quarter, the left twenty-three ounces and three-quarters. The liver weighed forty six ounces and a half; it was firm, full of blood, very finely mottled and smooth purplish-brown. The spleen weighed three ounces and a half; it was firm, full of blood, its trabeculæ distinct. The left kidney weighed eight ounces and a half, the right seven ounces; the cortical substance of the kidneys was ash-colored, the bases of the pyramids of a deep-blood color, the capsules separated readily. The suprarenal capsules were large, greenish-yellow internally, and very friable. In the interior of the left suprarenal capsule were several loose yellowish bodies of a fibrinous appearance. The pancreas was normal and weighed two ounces and a half. The stomach was large, its fundus congested. The mucous membrane of the duodenum was thin and soft; that of the jejunum was of a yellowish-ash color in its upper portion, purplish lower down; the ileum was dilated, its walls quite thin; all the patches of Peyer except the first were congested and dotted with black points. The cæcum was dilated and congested; the ascending colon at first presented a deep-purple color; farther up it was greatly contracted, of a deep-ash color with purple spots; the solitary glands had dark spots in their centres; the transverse colon was also much contracted; the descending colon, sigmoid flexure, and rectum were ulcerated; in the descending colon the ulcers were chiefly grouped along one of the longitudinal bands; they were of moderate size and had indistinct edges; in the sigmoid flexure they appeared as little pits, with indistinct edges, and were irregularly scattered over the mucous membrane; in the rectum they were of larger size, and quite irregular in shape.—Assistant Surgeon George M. McGill, U. S. A.

Case 356.—Private George Shertle, company D, 48th Pennsylvania volunteers; admitted from the hospital at Windmill Point, Aquia Creek, Virginia, February 8, 1863. Chronic diarrhœa. Died, March 21st, at 12.30 A. M. *Autopsy* thirty-six hours after death: Height five feet seven inches; no rigor mortis; body extremely emaciated; apparent age 20. The brain weighed forty-three ounces and a half; the veins of the pia mater and of the brain were congested; the gray matter was darker colored than usual; the pineal gland was absent. The right lung weighed eleven ounces and three-quarters, the left seven ounces and a quarter; the posterior portion of the upper and middle lobes of the right lung was congested, the rest of the lung normal. There were old pleuritic adhesions on the left side. The left lung was collapsed, and some portions carnified. The larger bronchi contained a quantity of muco-pus. The heart weighed six ounces and a half; its substance was quite firm; there were white fibrinous clots in both sides; that in the left side extended into the aorta. The liver weighed forty-four ounces and a half; it was quite firm, and full of dark-colored blood; the gall-bladder contained six drachms of light-yellow watery bile. The right kidney weighed five ounces and a half, the left six ounces; in the right kidney, which was generally congested, were a number of white points the size of millet-seed, which upon section yielded a puruloid matter; in the upper part of the left kidney was an abscess the size of a hazel-nut, full of bluish-white pus; this kidney also contained small white purulent deposits similar to those in the right kidney, but not so numerous. The spleen weighed four ounces and a quarter; it was firm, of a reddish purple color, its trabeculæ distinct. The suprarenal capsules were dark-yellow and friable; the left capsule was quite large. The pancreas was dark colored, and weighed an ounce and three-quarters. The mucous membrane of the stomach was thin and congested. The duodenum was dilated, its glands large. The valvulæ conniventes of the jejunum were generally of a purplish color, while the rest of the mucous membrane was normal; the middle third of the ileum was intensely congested; in places there were extravasations of blood; Peyer's patches were well developed, most of them dark colored, and presenting a mammillated appearance. The mucous membrane of the cæcum and ascending colon presented a number of dark-purplish congested spots and ulcers of variable size, which were generally small and superficial; in the transverse colon, which was irregularly congested, there were but a few small ulcers; in the descending colon there were none; the ulcers were numerous in the sigmoid flexure and rectum, which were intensely congested.—Assistant Surgeon George M. McGill, U. S. A.

Case 357.—Private James C. Hull, company H, 15th Connecticut volunteers; admitted February 8, 1863. Diarrhœa and debility. Died, March 26th. *Autopsy* eight hours after death: Height five feet five inches and a half; body very much emaciated; rigor mortis slight. The brain was quite firm, and weighed forty-six ounces and a half. The right lung weighed thirteen ounces, the left eight ounces; the posterior portion of the right lung was very much congested, the left healthy. The heart weighed seven ounces; its structure was firm; a mixed clot was found in the right side, none in the left. The liver

weighed thirty-three ounces and a quarter; its color was darker than usual; the gall-bladder contained from four and a half to five ounces of bile. The spleen was very firm, and weighed two ounces and a half. The pancreas weighed one ounce and a half. The right kidney weighed five ounces and a half, the left seven ounces and a quarter; both were of firm consistence. The rectum was ulcerated extensively and superficially, the ulcers being covered with a grayish-yellow pseudomembrane. The rest of the intestine was laid aside for examination, but was accidentally lost.—Assistant Surgeon George M. McGill, U. S. A.

Case 358.—Private Stephen Chambers, company F, 145th Pennsylvania volunteers; admitted February 20, 1863. Diarrhœa and ascites. Died, March 30th. *Autopsy* two hours after death: Height five feet five inches and a half; body rigid and considerably emaciated. The brain was firm and weighed forty-seven ounces and three-quarters; there were several globular cysts in the choroid plexus, giving it a racemose appearance. The lungs were anæmic and bluish; there was slight lobular emphysema of the apex of the right lung, and in its posterior part a carnified spot which measured two inches by an inch, was of deep-purple color on section, and sank in water; a similar carnified spot was observed in the lower lobe, which was adherent posteriorly. The pulmonary pleura between the lobes was roughened by a number of minute whitish points of exudation. The upper lobe of the left lung was normal, but bound to the lower lobe by tough adhesions; its edge was also adherent to the pericardium; the right lung weighed fifteen ounces and three-quarters, the left fifteen and a quarter. The pericardium contained twenty-seven drachms of serum. The heart was flabby, its surface œdematous; there was no adipose tissue about it, and it contained no clots; the valves were healthy. The aorta presented several small whitish spots of atheroma just above the semilunar valves. The arteries of the body were filled with black blood. The abdominal viscera were agglutinated together and to the abdominal parietes by firm recent adhesions. The omentum was obliterated. The liver was congested, presented the nutmeg appearance, and weighed fifty-five ounces and a quarter. The spleen was rather firm, of a uniform dark-lake color on section, and weighed seven ounces and a quarter. The suprarenal capsules were rather dark colored. The right kidney was pale, of a light-ash color, its pelvis highly injected; it weighed five ounces; the left kidney was similar to the right, and weighed five ounces and three-quarters. The pancreas was normal, and weighed two ounces and a quarter. The mucous membrane of the œsophagus and stomach was pale; the duodenum yellowish; the jejunum of a stone-gray color; Peyer's patches were pale and inconspicuous; the solitary glands not observable; the summits of the villi, especially on the valvulæ, presented blackened points. The mucous membrane of the large intestine was of a dark-gray color; that of the rectum of a dark dirty red; the entire large intestine, externally, was irregularly coated with a greenish exudation of lymph. In the cæcum there was a ragged dark-green ulcer.—Assistant Surgeon Harrison Allen, U. S. A.

Case 359.—Private Charles Bufleb, company F, 14th Connecticut volunteers; admitted from Finley hospital, Washington, D. C., March 18, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 14th Connecticut volunteers, admitted January 16th—typhoid fever—sent to general hospital January 25th. He does not, however appear on the register of the Finley hospital.] Died, April 3d. *Autopsy* one hour after death: Height five feet six inches, no post mortem rigidity; apparent age 30 years; there was diffuse suppuration of both parotid glands. The brain was firm, and weighed thirty-eight ounces and a half. The mucous membrane of the trachea was pale. The ramifications of the bronchi were filled with phthisical sputa. Miliary tubercles were disseminated through the right lung, most abundantly in its apex; on the surface of the upper lobe were long streaks of black pigmentary matter following the courses of the ribs; some of the lobules of this lobe were emphysematous, others carnified; the right lung weighed twenty-one ounces; its lobes were united together by recent lymph; the left lung was collapsed and presented nothing abnormal. The heart was pale; weight five ounces and a half; there was a good deal of adipose tissue on its external surface; there were no heart-clots. The aorta was slightly atheromatous just above the semilunar valves. The liver was purple externally, yellowish-purple internally; it weighed thirty-two ounces; the gall-bladder contained four drachms and a half of dark tenacious bile. The right kidney weighed seven ounces and a quarter, the left eight ounces; the cortical substance of both was pale, the pelves injected; the left kidney was rather darker colored than the right. The suprarenal capsules were large and dark colored. The spleen weighed three ounces; it was purple externally, light brownish-red internally, its texture firm. The pancreas weighed two ounces. The stomach was very small, the summits of its rugæ congested. The mucous membrane of the last five feet of the ileum was of a dark-purple color; Peyer's patches were normal, but in the neighborhood of the ileo-cæcal valve the solitary glands were tumefied. The mucous membrane of the large intestine was firm, generally dark colored, in some places purple; the solitary glands were numerous but healthy; there were no ulcers. The omentum was almost entirely void of fat, and extended to the pubis.—Assistant Surgeon Harrison Allen, U. S. A.

Case 360.—Private Walter Evans, company E, 11th Pennsylvania volunteers; age 21; in service twenty-three months; health previous to enlistment very good; admitted January 18, 1863. Chronic diarrhœa, from which he had suffered more or less for six months. He is anæmic, somewhat emaciated, and has about eight very copious evacuations daily of a thin gelatinous substance tinged with blood; the abdomen is tender. To take tincture of the chloride of iron, twenty drops, three times daily; also tannin and opium pills. To be confined to bed. Diet strictly farinaceous. This treatment was persevered in for about ten days, by which time he was much improved, the number of stools being reduced to three or four daily. The violence of the disease soon, however, returned after some slight imprudence, when he was put upon cod-liver oil, with tincture of the chloride of iron, and low diet. Solution of persulphate of iron and opium were subsequently tried, without any advantage; also the following: ℞. Extract of nux vomica eight grains, nitrate of silver two grains and a half, opium five grains; make ten pills. Take one every six hours. Under the influence of the last prescription the stools were again reduced to one or two daily, but the patient did not improve in strength or flesh. March 31st: He was suddenly seized with severe pneumonia. Died, April 3d.—Acting Assistant Surgeon Daniel Weisel. *Autopsy* thirteen hours after death: Height five feet five inches; rigor mortis moderate; some emaciation. The bronchial tubes were filled with a dark-purplish fluid. The upper lobe of the left lung was in the state of gray hepatization; on pressure a muco-purulent fluid exuded from its cut surface in large quantity; the lower part of the upper lobe and the upper part of the lower lobe of the right lung were hepatized, the rest of the lung congested; the right lung

weighed twenty-one ounces, the left twenty ounces. The heart weighed eight ounces; there was very little fat on its external surface; in the right auricle and ventricle was a firm fibrinous clot which extended into the pulmonary artery; in the left cavities was a similar but smaller clot which extended into the aorta. The pericardium contained six drachms and a half of fluid. The liver had the nutmeg appearance, and weighed seventy five ounces and a half; the gall bladder contained very little bile. The spleen was soft, of a dark-mulberry color, and weighed six ounces and a quarter. The left kidney weighed nine ounces and a half, the right eight ounces and a half; both kidneys were firm, their cortical substance of a light-pink color, the pyramids purple. The pancreas weighed three ounces. The stomach was dark colored, almost black in the fundus. The mucous membrane of the small intestine was firm and of a variegated pink; Peyer's patches were not enlarged, and the solitary glands were inconspicuous. The solitary glands were numerous in the cæcum and also in the vermiform appendix; the rest of the large intestine was of a dark-purple color mixed with red.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 361.—Private Albert Hopkins, company E, 89th New York volunteers; age 43; enlisted December 4, 1861; admitted February 8, 1863. Chronic diarrhœa. The first notes were taken April 1st. At that time the patient still suffered from diarrhœa. He said that he contracted the disease in September, 1862, and had not been free from it since. He had on an average four thin watery passages daily. He was weak and somewhat emaciated. There was marked tenderness on pressure over the abdomen, but no enlargement of the liver or spleen could be detected. His face was nearly covered with a pustular eruption resembling acne; his feet and legs were œdematous. On examination of the urine nothing abnormal was detected. The heart and lungs appeared to be healthy. His mind was disturbed, and at times he appeared to be perfectly demented. He was ordered to take, every three hours, a pill containing a grain and a half of acetate of lead and a grain each of opium and capsicum; also a laudanum enema at night. Farinaceous diet. April 7th: Has had but two passages in the past twenty-four hours; complains of severe pain in the loins. Ordered half an ounce of castor oil. Discontinue the pills until the oil operates. Also six dry cups over the seat of pain. April 16th: Since last date the patient has resumed the pills and seems a little better, but still complains of pain in the back. Continue treatment. Again apply six dry cups over the seat of pain. April 27th: I learned that he was in the habit of getting various kinds of indigestible food from the sutler; he was, therefore, confined to his bed. May 1st: The discharges from the bowels are nearly natural, and the patient is again allowed to sit up. May 7th: He was seized with severe pain in the loins, which was relieved by dry cups. May 8th: He had a return of the pain, which was not relieved by cups, but yielded to the influence of a large opiate enema. It was observed that his back was œdematous. May 9th: He had a severe epileptiform convulsion, preceded by retention of urine. The urine was drawn off by the catheter. On examination it was found to contain nothing abnormal. May 10th: He had four convulsions, and was delirious from this date until death. Died, May 16th, at 12.15 A. M.—Acting Assistant Surgeon G. K. Smith. *Autopsy* ten hours and three-quarters after death: Height five feet four inches; body rigid; no emaciation. The brain was apparently healthy; weight forty-five ounces and a quarter. The trachea and bronchial tubes, including the smaller ramifications, were filled with a fine bronchial secretion; the mucous lining was slightly injected. The upper lobe of the right lung was small and of a grayish color anteriorly; posteriorly it was congested; there were old adhesions at its apex, and the pigmentary deposit was rather abundant; the middle and lower lobes were also hypostatically congested. The left lung was congested posteriorly in a similar manner; on the surface of its lower lobe were numerous small ecchymosed spots. The heart was normal. The pericardium contained two drachms of fluid. The liver weighed sixty-nine ounces; there was a thin layer of recent lymph on its upper surface; on section it was of a pale flesh-color, its acini almost obliterated; the gall-bladder contained eleven drachms of ochre-colored bile. The spleen was six inches long and four inches wide, of a dull lake color and very soft. The pancreas was normal; it weighed two ounces and three quarters. The right kidney weighed seven ounces and a quarter, the left seven ounces and a half; the cortical substance of both was rather pale. The œsophagus was pale; the stomach slightly congested; the small intestine apparently normal. The large intestine was inflated with gas; its mucous membrane was slate-colored.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 362.—Private George Johnson, company H, 17th Mississippi infantry, (Confederate;) admitted May 13, 1863. Chronic diarrhœa. He was much emaciated and very weak. The motions were frequent, fluid, of a dark-green color and very fetid. His pulse was quick, compressible, and irregular; his skin hot; face flushed; tongue parched, smooth, covered with a brownish fur, and fissured; teeth and lips coated with nearly black sordes. He complained of pain in the chest, also of tenderness in the abdomen; wandered in his mind and was restless, being kept in bed with difficulty. He had at first a slight dry cough with a little frothy expectoration; this, however was soon changed, the cough becoming more violent, the sputa viscid and rusty, the breathing hurried, painful, and very difficult. On auscultation, bronchial respiration and bronchophony were heard on both sides. Treatment: Stimulants, tonics, anodynes, laudanum injections, and counter-irritation to the chest. Died, May 21st.—Acting Assistant Surgeon B. P. Brown. *Autopsy* eighteen hours after death: Body emaciated; some rigor mortis; height five feet ten inches and a half; apparent age 30 years. The brain weighed fifty-five ounces; was of firm consistence, and not congested. The œsophagus was natural, its mucous lining yellow. The lining membrane of the trachea was darkish green in color; it contained much bronchial secretion, and minute quantities of pus adhered between the cartilaginous rings. The lobes of the right lung were interadherent, and the whole lung was covered externally by recent lymph; on section the upper lobe appeared flabby, of a dark-reddish color, and contained a large quantity of black pigment; on pressure a fine bronchial secretion exuded; the middle and lower lobes were in a state of red hepatization, except parts of the lower lobe, which had advanced to gray hepatization. The upper lobe of the left lung was divided into three distinct lobes; its pigmentary matter was very abundant; the posterior part of this lobe was congested, and of a dark-purple hue; the lower lobe was hepatized, dark-purple, with much pigment externally, and coated by recent lymph; on section the hepatized tissue was of a purplish-red color; the right lung weighed fifty-two ounces and a half, the left thirty-eight and a half. The heart weighed twelve ounces and a quarter; its right side contained a large recent fibrinous clot which extended into the pulmonary artery; the lining membrane of the left ventricle had a dark tinge. A slight atheromatous deposit was observed in the aorta just above the semilunar valves. The pericardium contained an ounce of serum. The liver weighed seventy-one ounces; its parenchyma

was pale, the acini well defined; the gall-bladder contained an ounce of bile. The spleen was soft, and weighed ten ounces and a half. The pancreas was of normal color, and weighed four ounces and a half. The right kidney weighed ten ounces and a half, the left nine and a half; both kidneys were pale and flabby. The stomach was of a dark slate-color, tinged with ochre in the fundus, and pale near the pylorus. The small intestine was apparently healthy, of a pale color, and filled with pasty tenacious fæces; Peyer's glands and the solitary follicles were not conspicuous. The mucous lining of the large intestine was mottled of a pale-gray color, and coated in patches with a peculiar diphtheritic exudation, which was most prominent on the mucous folds; in some places there were superficial ulcerations. The intestines were moderately distended with flatus.—Assistant Surgeon Harrison Allen, U. S. A.

Case 363.—Private John A. Hopper, company E, 22d New Jersey volunteers; admitted April 19, 1863. Diarrhœa and pneumonia. [This man appears on the register of the regimental hospital of the 22d New Jersey volunteers, then near Belle Plain, Virginia, as admitted April 8th—typhoid-remittent fever—sent to general hospital April 18th.] Died, May 25th. *Autopsy* forty-seven hours after death: Height five feet eleven inches; some rigor mortis; skin dry and furfuraceous. The brain weighed forty-seven ounces and a quarter. The œsophageal mucous membrane was pale and soft; that of the trachea highly congested and soft. The upper and middle lobes of the right lung appeared on section of a deep reddish-purple color, and exuded a large amount of frothy bronchial secretion; they floated in water; the lower lobe was of a blackish-purple color, and presented emphysematous patches on its surface; it exuded a dark venous fluid, but little or no bronchial secretion; the left lung was similar in appearance to the right. The two pleural sacs contained six ounces and three-quarters of bloody serum. The heart weighed eleven ounces and a quarter; its right side contained a soft venous clot, the left ventricle a small white clot. The spleen was soft, pultaceous, and of a dark-lake color; it weighed twelve ounces and three-quarters. The liver was pale, its acini distinct; it weighed fifty-eight ounces; the gall-bladder contained seven drachms of bile. The pancreas weighed two ounces and a quarter. The right kidney weighed four ounces and a half, the left four and a quarter. The stomach was distended with gas; its mucous membrane blackish near the pylorus, the rest natural. The duodenum was much discolored by dark-purplish patches; the rest of the small intestine, except near the ileo-cæcal valve, was healthy; Peyer's patches were pale, not ulcerated or elevated; near the ileo-cæcal valve were numerous circular superficial ulcers penetrating to the submucous tissue; the solitary glands were prominent, but their contents were not blackish; those of the vermiform appendix were prominent. The large intestine was pale; a superficial ulcer of some size, with a blackish base, was found in the ascending colon; about eighteen inches from this was a smaller ulcer with ragged edges, and a short distance from this a third ulcer, not unlike the first, but more ragged. The intestines were distended with gas, especially the colon. The omentum contained very little fat.—Assistant Surgeon Harrison Allen, U. S. A.

Case 364.—Private William L. Snyder, company A, 12th United States infantry; admitted April 20, 1863. Chronic rheumatism. [This man appears on the hospital register of the 12th United States infantry, taken sick April 6th—diarrhœa—sent to general hospital April 19th.] Died, June 2d, of chronic diarrhœa. *Autopsy* twenty-four hours after death: Height five feet seven inches; body emaciated; rigor mortis slight. The brain was healthy and weighed fifty-four ounces. The mucous membrane of the œsophagus was firm and of a light-purple color. The trachea contained much bronchial secretion; its mucous membrane was purplish. Both lungs were pale stone-gray externally, lake-red on section, and yielded on pressure a fine bronchial secretion mixed with venous blood; they were permeated with air throughout; on the posterior surface of the lower lobe of the right lung was a small patch of old lymph; the right lung weighed nineteen ounces, the left twenty-four ounces. No fluid was found in the pericardium. The heart weighed nine ounces; in its right side was a very small fibrinous clot; in the left side large mixed clots which extended into the aorta; the valves were healthy. The liver weighed forty-five ounces; the gall bladder contained six drachms of very dark-colored bile. The pancreas weighed three ounces and a quarter; it was healthy, and of a pale flesh-color. The spleen weighed six ounces. Both kidneys were pale; the right weighed seven ounces, the left seven ounces and a half. The mucous membrane of the fundus of the stomach was blackish, the rest mottled gray and crimson. The small intestine was healthy, but much distended with gas; Peyer's patches healthy and not ulcerated. The mucous membrane of the large intestine was slate-colored, but there were no ulcers except one or two small ones near the anus. The transverse colon was much distended with gas. The omentum small, almost denuded of fat, and pushed up toward the diaphragm.—Assistant Surgeon Harrison Allen, U. S. A.

Case 365.—Private Charles Peifer, company B, 52d New York volunteers; enlisted August 14, 1861; admitted February 27, 1863. Chronic diarrhœa. The patient stated that he had enjoyed good health until June, 1862, when he contracted diarrhœa on the peninsula; had been in regimental or general hospital ever since. He caught cold in January, 1863; since that time he has had more or less cough and dyspnœa. June 22, 1863, when this memorandum was taken, the patient was in a dying condition. He had dyspnœa, constant inclination to cough, and much mucous rattling in the throat. Chest resonant on percussion, but hepatic dulness as high as the fifth rib. His feet are swollen, and have been so for the last six weeks. He is exceedingly weak, and his general appearance is that of a consumptive. He has constant diarrhœa; tongue clean and red; pulse 102; abdomen painful on pressure. He died June 23d. *Autopsy* four hours after death: Height five feet six inches; upper part of body very much emaciated; abdomen swollen; legs œdematous. The lining membrane of the trachea was pale, that of the bronchial tubes purplish. The upper lobe of the right lung was adherent to the thoracic parietes, and infiltrated with tubercles; it contained a cavity the size of a chestnut near its apex; this cavity was filled with pus; in the lower lobe were a number of cheesy tubercles the size of marrow-fat peas; the pulmonary tissue between these tubercles was congested. There were firm pleuritic adhesions on the left side. In the apex of the upper lobe of the left lung were numerous disseminated tubercles; the lower lobe was congested. The right lung weighed twenty-five ounces, the left twenty-four. The pericardium contained two drachms of limpid serum. The heart weighed eight ounces; the right auricle and ventricle contained large clots, the left auricle a small one. The liver presented the nutmeg appearance; it measured thirteen inches by six, and was two inches thick; the gall-bladder contained seven drachms of blackish-green bile. The spleen weighed thirteen ounces and

a half, was moderately firm, and of a dull-lake color. The pancreas weighed three ounces and a quarter. The right kidney weighed five ounces, the left five and a quarter; both kidneys were pale, their cortical substance yellowish. The omentum was contracted and doubled up under the stomach. The mucous membrane of the stomach was slate-colored. The duodenum was healthy. Peyer's patches were ulcerated. The large intestine was thickened and extensively ulcerated.—Assistant Surgeon Harrison Allen, U. S. A.

Case 335.—Private David Walker, company D, 19th Pennsylvania volunteers; admitted July 30, 1863. Chronic diarrhœa. Had suffered from this disease since April 12th. When admitted he was very much emaciated, and had considerable fever; tongue flabby and furred; pulse 61; bowels loose; stools thin, and varying from four to twelve daily; appetite poor. August 7th: Is very restless; has no appetite; suffers much from thirst; tongue parched; has high fever, and some sordes on the teeth; lies in a half unconscious state. August 8th: The stools are involuntary, quite watery, and produce green stains on linen. Died, August 9th. *Autopsy* twenty-three hours after death: Body emaciated; rigor mortis well marked; apparent age 23; height five feet nine inches. The brain was moderately firm, and weighed forty-nine ounces and a half. The mucous membrane of the trachea was of a greenish color, probably due to post mortem change. The lymphatic glands at the bifurcation of the trachea were very large, soft, greenish, and contained some calcareous matter. The right lung weighed seventeen ounces and a half; the posterior portion of its upper and middle lobes and the whole of the lower lobe were engorged with venous blood; the left lung weighed fourteen ounces; its upper lobe was congested at the apex, healthy elsewhere; the lower lobe was œdematous, purplish exteriorly; on section a large quantity of thin watery fluid poured out. The heart weighed six ounces and a half; its valves were healthy; it contained no clots; the endocardium was purplish. The liver was very flabby; it weighed forty-three ounces; the gall-bladder contained four drachms of bile. The spleen was firm and of a mahogany color; it weighed six ounces. The pancreas was healthy, and weighed three ounces. The cortical substance of the kidneys was pale, the pyramids purple, the pelves bluish; the kidneys weighed five ounces and a half each. The walls of the small intestine were quite thin; its mucous membrane presented a dark-purple congested appearance; Peyer's patches, which were not swollen, were of a dingy stone color, with central dots of pigment in the follicles composing the patches. The large intestine presented nothing remarkable except in its lower portion, where the mucous membrane was of a deep crimson color; there was no ulceration or exudation of lymph on its surface.—Assistant Surgeon Harrison Allen, U. S. A.

Case 357.—Private Elbridge C. Crane, company D, 1st Maine cavalry; admitted August 18, 1863. Chronic diarrhœa. [This man appears on the hospital register of the Cavalry corps of the army of the Potomac, Warrenton Junction, Virginia, admitted August 15th—diarrhœa—sent to general hospital August 18th.] Died, August 23d. *Autopsy* seven hours and a half after death: Body well developed; rigor mortis strong; apparent age 20; height five feet six inches. The brain was firm, and weighed fifty-four ounces; the pia mater was injected, particularly on the external side of the left hemisphere. The lateral ventricles contained half a drachm of clear serum slightly tinged with blood. The mucous membrane of the upper portion of the œsophagus was pale, toward the cardiac orifice it was darker colored. The mucous membrane of the upper portion of the trachea was pale, lower down it was purplish between the rings. The bronchial gland at the bifurcation of the trachea contained a calcareous deposit. The right lung weighed twelve ounces and a half, the left ten ounces; both lungs were congested. The pericardium contained a drachm and a half of fluid. The heart weighed eight ounces; its valves were healthy; the right auricle was filled with a soft black clot, which extended into the right ventricle and thence into the pulmonary artery; there were no clots on the left side. The liver was of a light-purple color, its acini well marked, its capsule readily torn; it weighed sixty-seven ounces; the gall-bladder contained eight drachms of dark greenish-brown bile. The spleen was very firm, of a liver-color on section, and weighed five ounces and a half. The pancreas was pale but healthy, and weighed two ounces and a half. The right kidney weighed four ounces; weight of the left not recorded; both were slightly congested, their capsules readily torn, their pelves pale. The suprarenal capsules were lighter externally than internally, and of a brownish-ochre color. The mucous membrane of the stomach was firm and of a grayish color. The small intestine was healthy, except in its lower third, where the mucous membrane was congested. The mucous membrane of the large intestine presented a ragged appearance, due to the irregular distribution of a diphtheritic exudation; this was of a light-greenish color, and lay in a thick layer on the surface; those portions of the membrane which were not covered by the exudation presented an angry inflamed appearance and minute ecchymosed spots.—Assistant Surgeon Harrison Allen, U. S. A.

Case 368.—Private John A. Poer, company D, 4th Georgia (rebel) infantry; age 23; admitted August 3, 1863. Chronic diarrhœa. Died August 23d. *Autopsy* twenty-seven hours after death: Body emaciated; rigor mortis slight; height five feet seven inches. The brain was healthy, and weighed forty-eight ounces and a half. The mucous membrane of the œsophagus was of a deep-yellow color throughout, roughened above, smooth below; that of the trachea was pale, slightly purplish between the rings; the trachea contained a brownish fluid. The right lung weighed fifteen ounces and a quarter, the left twelve and a half; the lower lobes of both lungs were deeply congested. The pericardium contained half a drachm of fluid. The heart weighed eight ounces and a half; the right ventricle contained a long fibrinous clot, which extended a short distance into the pulmonary artery; the left cavities were filled with venous blood, part of which formed a soft clot in the ventricle. The liver was healthy, and weighed forty-eight ounces. The spleen was unusually firm, of a dark grayish-red color internally, grayish-green externally; it weighed five ounces. The pancreas was healthy, and weighed two ounces and a half. The right kidney weighed five ounces and a quarter, the left five and a half; in both the cortical substance was pale and slightly injected on the surface, the pyramids purple, the pelves pale; at the upper portion of the right kidney there was a depressed softened spot in which the parenchyma was undergoing some degenerative change. The small intestine was healthy. The large intestine was extensively ulcerated. The ulcers were small, mostly distinct, but occasionally confluent; they had blackish borders and pale bases. In the lower portion of the intestine the mucous membrane was dark colored, and presented a few patches of discolored shreddy exudation.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 369.—Private Orange Pickett, company K, 7th Michigan cavalry; age 33; admitted August 18, 1863. Chronic diarrhœa. [This man appears on the register of the hospital of the Cavalry corps of the army of the Potomac, then near Warrenton Junction, Virginia, admitted August 16th—diarrhœa—sent to general hospital August 18th.] Died, August 24th. *Autopsy* twenty hours and a half after death: Body not emaciated; rigor mortis strong; height five feet six inches. The brain was healthy, and weighed fifty-four ounces; the lateral ventricles contained but little fluid. The mucous membrane of the œsophagus was pale above, of a light-ochre color toward the cardiac orifice. The trachea contained a small quantity of frothy secretion; its mucous membrane was pale with purplish spots, the spaces between the rings being of a darker hue than the rings themselves. There were extensive old pleuritic adhesions on the right side. The right lung weighed nineteen ounces and a half; it was congested throughout, but sections floated in water; the left lung also was congested, and weighed eighteen ounces and a half. The pericardium contained four drachms and a half of fluid. The heart weighed ten ounces; its valves were healthy; its right cavities contained a large fibrinous clot which extended into the pulmonary artery beyond its bifurcation; the left cavities contained a smaller clot. The liver was firm, its acini well marked, its capsule readily elevated; it weighed seventy-six ounces and a half; the gall-bladder contained eight drachms and a half of thick tar-like sienna-brown bile. The spleen weighed fourteen ounces; it was of a dark flesh-color externally; its trabeculæ were prominent, its texture unusually firm. The pancreas was firm and of a dull white color. The kidneys were flabby, and weighed five ounces and a half each; their cortical substance was unusually pale, with slightly injected vessels, the pyramids of a darker hue, the pelves of a delicate pink; the left kidney was somewhat more injected than the right. The small intestine presented nothing abnormal except in its lower third; here the mucous membrane was of a dark-purple color and greatly softened, being readily detached by the finger-nail; the purple color seemed to be below the surface, and was surmounted by a tawny-green appearance resembling an exudation; this was due to the altered color of the villi, as was evident on placing the specimen under water; Peyer's patches were not affected, and the solitary glands were not visible. The large intestine, from one end to the other, presented extensive ragged confluent ulcerations; the surface was studded irregularly with elevated patches of a dark-red color, which at first sight resembled mucous membrane, but which were found to consist of a soft exudation-product readily removed by the finger.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 370.—Private Robert Johnson, company I, 11th North Carolina (rebel) infantry; admitted August 3, 1863. Chronic diarrhœa. Died, August 25th. *Autopsy* four hours and a half after death: Body greatly emaciated; rigor mortis very strong; apparent age 20; height five feet six inches. The brain was pale, of normal consistence, and weighed forty-six ounces and a half; the veins of the pia mater contained but a small quantity of blood; the lateral ventricles contained a drachm of clear serum. The right lung weighed twelve ounces, the left nine and a half; both lungs were of a grayish-slate color anteriorly, and posteriorly pink with purplish patches; a considerable quantity of dark venous blood escaped from cut surfaces on pressure; the lower lobe of the right lung presented posteriorly a hard spot about two inches in diameter, which extended into the parenchyma about half an inch, and was apparently the result of former inflammation; numerous delicate adhesions were found between the lobes of the left lung. The mucous membrane of the upper part of the œsophagus was very pale, in the lower part it was slightly injected; that of the larynx and trachea was also pale; the spaces between the tracheal rings were slightly purple. The trachea contained a small quantity of yellowish-white mucus. The pericardium contained a drachm and a half of clear light straw-colored fluid. There was some emphysema of the cellular tissue surrounding the pericardium. The heart weighed eight ounces and a half; its valves were healthy; the right cavities contained a firm fibrinous clot of a dirty reddish hue, which extended into the superior vena cava and the pulmonary artery; the left ventricle contained a mixed clot. The surface of the liver was light purple with yellowish spots; internally it was of a yellowish chocolate color; its acini were well marked; it weighed forty-seven ounces; its left lobe was very small, ($4\frac{1}{2} \times 2\frac{1}{2} \times 1$ inch;) the gall-bladder contained an ounce and a half of clear straw-yellow bile with a yellowish flocculent sediment. The spleen weighed three ounces and a half; its surface was in part purplish-blue, in part greenish-slate color, the interior was of a chocolate-red; the Malpighian bodies were numerous and well marked; the organ was rather firmer than usual. The pancreas was firm, yellowish-white, and weighed three ounces. The kidneys were pale, and weighed four ounces and a half each; the right kidney presented on its upper part two elliptical cysts about a quarter of an inch in long diameter. The rugæ of the stomach were unusually well marked. The mucous membrane of the jejunum and upper part of the ileum was pale; in the lower third of the ileum it presented a purplish appearance, and Peyer's patches were somewhat injected. The cæcum was of a deep purple color; the whole tract of the large intestine presented numerous minute round ulcers, which were thickly crowded together; in the sigmoid flexure and the rectum were irregular patches of a tawny-green color, varying in size from an inch and a quarter to half an inch in diameter, from which the mucous membrane appeared to be entirely removed.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 371.—Corporal John A. Pitts, company B, 7th Wisconsin volunteers; age 35; admitted June 24, 1863. Chronic diarrhœa. This man was healthy when enlisted. He was first taken sick while on duty near Falmouth, Virginia, about a month and a half ago. Has now four or five watery light-colored passages daily. September 1st: About the beginning of last month the patient seemed in a fair way to recover. He is now much worse, the passages numbering eight or more daily; the abdomen is sunken and painful to the touch, the tongue dry and red. He is very much emaciated. Died, September 10th. *Autopsy* twenty hours after death: Body slightly emaciated; some rigor mortis; height five feet seven inches. The brain was firm, and weighed fifty-four ounces; the vessels of the pia mater contained rather less blood than usual; the ventricles were empty. The mucous membrane of the œsophagus was of a greenish-blue color, in its lower part it was slightly yellow; that of the trachea was pale, slightly purple between the rings; there was a small quantity of frothy mucus at the bifurcation of the bronchial tubes. The lungs were crepitant throughout, but congested posteriorly, especially in the lower lobes; on section of these a good deal of venous blood exuded, mixed with frothy serum. The heart weighed nine ounces; its right cavities contained a small fibrinous clot which extended into the pulmonary artery; the left cavities were contracted and empty. The liver was healthy, and weighed fifty-one ounces and a half; the gall-bladder contained five drachms of thick greenish bile of the consisteney of molasses. The pancreas was normal, and weighed two ounces. The spleen weighed four ounces and a half; its capsule was

greenish and somewhat corrugated; it was lobed at its upper extremity; its interior of a reddish chocolate-brown color; the Malpighian corpuscles and the trabeculæ were prominent. The kidneys were healthy; the right weighed five ounces and a half, the left five ounces. The mucous membrane of the stomach was a greenish color, with minute bloody points at the pyloric extremity. The small intestine was healthy, except that the lower part of the ileum was much congested, and presented at one spot, near the ileo-cæcal valve, a greenish exudation. The large intestine was extensively ulcerated throughout its whole course; the ulcers were generally of an ovoid form, their long diameter transverse to the course of the intestine; they varied in size from that of a split-pea to that of a pin's head, many of them surrounded by a greenish exudation of lymph; and a similar exudation appeared on the mucous surface between the ulcers.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 372.—Private Joseph Matthews, company G, 9th New York cavalry; admitted September 12, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 9th New York cavalry, admitted September 1st —remittent fever. He is borne on the register of the hospital of the Cavalry corps of the army of the Potomac, admitted September 8th—dysentery—and sent to general hospital September 12th.] Died, September 14th. *Autopsy:* Height five feet eight inches; apparent age 35. The brain was healthy; it weighed forty-six ounces, and contained little or no fluid. The trachea contained a few masses of tenacious mucus; its mucous membrane was purplish. The right lung weighed nineteen ounces; its upper lobe was much congested; the middle lobe was bound to the thoracic parietes by old adhesions; the left lung weighed thirteen ounces and a half; both lobes were engorged with blood. The heart weighed eight ounces and a half; the right auricle was empty; its lining membrane was dark-red; the right ventricle contained a quantity of venous blood, and a thin fibrinous clot which extended into the pulmonary artery; the left auricle contained a small firm fibrinous clot. The liver was healthy; the gall-bladder was full of yellowish turbid bile. The spleen was firm, and weighed four ounces and a half. The pancreas was pale and firm; it weighed three ounces. The right kidney weighed five ounces; its cortical substance was of an ash-red color and rather flabby; the left kidney weighed four ounces and a half; its cortical substance was of a dark-purple color and firm. The œsophagus, stomach, and small intestine presented nothing abnormal. The mucous membrane of the cæcum and ascending colon was of a dark-green color, and presented a number of large ulcers with ragged excavated borders; in the transverse and descending colon, as far as the sigmoid flexure, the mucous membrane was thickened and covered in many places with a characteristic exudation.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 373.—Private George W. Beam, company F, 1st Pennsylvania cavalry; age 42; admitted September 12, 1863. Chronic diarrhœa. [This man appears on the register of the hospital of the 1st Pennsylvania cavalry, admitted August 11th —intermittent fever. He is borne on the register of the hospital of the Cavalry corps of the army of the Potomac, admitted August 15th—intermittent fever—returned to duty August 30th. No subsequent record can be found prior to his admission to Lincoln hospital.] Died, September 16th. *Autopsy* thirteen hours after death: Height five feet nine inches; rigor mortis slight; body not much emaciated. The vessels of the pia mater were slightly distended with blood; the ventricles contained three drachms of fluid; the brain was a little softer than usual, but otherwise healthy; it weighed fifty-three ounces and a half. The mucous membrane of the œsophagus was firm; its upper portion had a faint purplish tinge, the lower portion was light-yellow. The trachea contained a quantity of frothy secretion; its mucous membrane was pale, but had a slight purplish tinge between the rings. The lungs were of a dark bluish-slate color externally. The right lung weighed seventeen ounces and a half; its upper and middle lobes were bound together by old adhesions; it was crepitant throughout, of a dirty red mottled with green on section, and venous blood mixed with frothy mucus exuded from the cut surfaces on pressure; the lower lobe was rather more congested than the others; the left lung weighed sixteen ounces, and presented the same characteristics as the right. There was very little pericardial fluid. The heart weighed eight ounces; its right cavities contained large, firm, fibrinous clots, which extended into the pulmonary artery beyond its bifurcation; the left ventricle contained a small fibrinous clot extending into the aorta; there was a small quantity of venous blood in the left auricle. The liver weighed sixty-four ounces; it was unusually pale, its capsule readily separated, its acini indistinct; the gall-bladder contained a drachm of thick orange yellow bile. The pancreas was white and firm; it weighed three ounces and a half. The spleen was firm; its parenchyma was of a pale chocolate-color; it weighed four ounces and a half. The right kidney weighed four ounces, the left four and a half; the cortical substance of both was pale, the pyramids injected, the pelves pale. The small intestine was healthy down to the lower part of the ileum, the mucous membrane of which was of a deep-purplish color, thickened and coated with shreds of congulated lymph, which was in some places yellowish, in others of a dark-green hue. The cæcum presented a few ovoid ulcers with marked vascular congestion around them. The lower part of the large intestine was extensively ulcerated, the mucous membrane in some places being almost entirely destroyed; the ulcers were small, ovoid, and the mucous membrane between them was coated with a thick layer of lymph, which was greenish in some places, reddish in others.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 374.—Private Mark Colgin, company M, 13th Pennsylvania cavalry; admitted September 17, 1863. Chronic diarrhœa. Died, September 18th. *Autopsy* four hours after death: Body not much emaciated; rigor mortis well marked; apparent age 20; height five feet five inches. The veins of the pia mater were moderately filled with dark blood; the ventricles contained half a drachm of grayish fluid; the brain was firm and apparently healthy; it weighed forty-seven ounces. In the upper part of the œsophagus there were a number of slightly elevated white maculæ, between which the mucous membrane was of a light-purple color; in the lower part of the œsophagus the membrane was reddish. The trachea was full of thick frothy mucus; the membrane over the rings was pale, between them it was unusually purple. The exterior of the lungs was of a grayish-purple with bluish spots, which were most numerous posteriorly; on incision both lungs were found to be congested posteriorly, and a quantity of frothy mucus exuded; the lobes of the right lung were bound together by old fibrinous bands. The pericardium contained nine drachms of straw-colored fluid. The heart weighed thirteen ounces; its right cavities contained venous clots; the lining membrane of the right auricle was reddened; the left auricle was empty, its lining membrane pale; the left ventricle contained a small venous clot. There was a small quantity of straw-colored serum in the abdominal cavity. The omentum was loaded with fat. The liver was healthy; it weighed fifty-nine ounces; the gall-bladder contained six drachms of orange-yellow

bile. The pancreas was normal, and weighed two ounces and a half. The spleen was soft, of a dark-purplish color internally, the Malpighian corpuscles well-marked; it weighed thirteen ounces and a half. The kidneys weighed five ounces each; both were slightly congested, the right most so. The mucous membrane of the stomach was pale, with a few reddish points; that of the small intestine was unusually pale. In the lower part of the ileum Peyer's patches were slightly elevated, and one of them near the cæcum ulcerated; the solitary glands were enlarged, reddened, and slightly ulcerated. The mucous membrane of the large intestine was also generally pale; in its upper portion it presented numerous bright-red spots with ulcers in their centres; these were apparently the solitary glands, which here, as in the small intestine, seemed to be the chief seat of the disease. The mesenteric glands were enlarged.—Assistant Surgeon Harrison Allen, U. S. A.

Case 375.—Private Edward McCann, company G, 69th Pennsylvania volunteers; age 34; admitted September 12, 1863. Chronic diarrhœa and hepatic abscess. Died, September 27th. *Autopsy* fourteen hours after death: Height five feet ten inches; some rigor mortis. The brain weighed fifty-two ounces; it was somewhat soft. The mucous membrane of the trachea was generally pale, the spaces between the rings slightly purplish. The right lung weighed nine ounces and a half; it was pale and anæmic except the lower lobe, which was somewhat congested posteriorly; the left lung weighed eight ounces, and presented the same appearances as the right; both lungs were peculiar from the absence of the frothy bronchial secretion usually seen on section. The pericardium contained six drachms of fluid. The heart weighed eight ounces; in the right auricle there was a large fibrinous clot which extended upward into the descending vena cava, downward into the ventricle, and thence into the pulmonary artery; the left side of the heart also contained a fibrinous clot, but of smaller dimensions than that in the right. The liver measured eleven by eight by five inches; it contained a number of purulent deposits; these appeared on the external surface as whitish circular spots, about an inch and a half in diameter, surrounded by a purple areola; some of them had a little fibrinous lymph adhering over them; between them the surface of the liver was mottled with yellow and red; on section the parenchyma was pale except immediately around the deposits, where it was congested. The spleen was firm and dark colored; it weighed five ounces and a half. The right kidney was healthy, and weighed four ounces and a quarter; the left kidney was markedly congested, and weighed four ounces and a half. The small intestine appeared to be perfectly healthy. The large intestine, from the cæcum down, was extensively ulcerated; the mucous membrane between the ulcers was of a dark stone-gray color, and not covered by any exudation; the ulcerated patches, however, had a thin diphtheritic coating on the exposed muscular coat.—Assistant Surgeon Harrison Allen, U. S. A.

Case 376.—Private Hezekiah S. Palmer, company E, 42d Mississippi (rebel) volunteers; admitted August 18, 1863. Chronic diarrhœa. Died, October 10th. *Autopsy:* Rigor mortis not marked; body not much emaciated. The brain was healthy; it weighed fifty-two ounces. The right pleural sac contained three ounces and a half of fluid, the left four ounces. The trachea was filled with a thin bronchial fluid; its mucous membrane was pale. The right lung weighed nineteen ounces and a half; its upper and middle lobes appeared pale on section, and exuded a quantity of thin bronchial secretion; the lower lobe was congested, and the bronchial secretion was mixed with blood; this lobe was bound to the thoracic parietes by old fibrinous adhesions; the left lung weighed twenty-three ounces and a half; its upper lobe resembled that of the right lung; the lower lobe was purplish-red externally, with a quantity of shreddy recent lymph adhering to its surface; the upper two-thirds of this lobe were in a state of red hepatization. The heart weighed ten ounces and a quarter; its valves were healthy; the right auricle contained a venous clot, the right ventricle a large, soft, fibrinous one; there was a thin ribbon-like clot in the left auricle. The liver weighed forty-seven ounces; it was pale, firm, its capsule easily torn, its acini prominent; the gall-bladder contained eight drachms of brownish flocculent bile. The spleen was readily broken up; it weighed ten ounces and a half. The pancreas weighed three ounces and a quarter. The right kidney weighed five ounces and a half, the left five. The intestines were anæmic and of a stone-gray color externally; the mucous membrane was flaccid and pale; the valvulæ conniventes were nowhere prominent, and in some places were absent; the mucous membrane was extremely soft and readily removed. This case is interesting inasmuch as chronic diarrhœa had existed for a long time and no ulceration of the large or small intestine was observed after death.—Assistant Surgeon Harrison Allen, U. S. A.

Case 377.—Drummer David Ebert, company I, 123th New York volunteers; admitted from the army of the Potomac September 12, 1863. Chronic diarrhœa. Died, October 22d, of diphtheria and pneumonia. *Autopsy* thirty-six hours after death: Apparent age 22; height five feet eleven inches; some rigor mortis; body not much emaciated. The brain weighed fifty-seven ounces and a half; it was moderately firm; there was but little fluid in the ventricles; the pia mater was moderately injected. The œsophagus was pale except at its upper portion, where it was of a mottled purple color, and covered by a diphtheritic exudation continuous with that lining the pharynx and larynx; the mucous membrane of the larynx and trachea was of a dark-purple color, and coated with a thick consistent layer of diphtheritic membrane which extended into the bronchial tubes; this pseudomembrane was also of a purple color, being darkest on the side next the mucous membrane. The right lung weighed thirty-three ounces and a half; the greater portion of its upper lobe and the posterior part of the middle lobe were in the stage of red hepatization; there were also a number of hepatized lobules in the lower lobe, the dark color of which contrasted strikingly with the brighter red of the intervening congested but still permeable parenchyma; the left pleural cavity contained twenty-four ounces of straw-colored serum. The left lung weighed twenty ounces and a half; its upper lobe was emphysematous anteriorly, posteriorly it was infiltrated with yellow serum, and portions sank in water; the lower lobe was in a similar condition in its upper portion, its lower portion was hepatized red; in the apex of this lung there were a few tubercles, some of which had become cretefied. The pericardium contained an ounce of fluid. The heart was healthy, and weighed nine ounces and a quarter; the left ventricle contained a whitish fibrinous clot mottled with red in the centre and ragged on its edges. The liver weighed fifty-seven ounces and a half; it was engorged with purple blood, its parenchyma extremely soft, its acini prominent on account of the venous engorgement of the portal veins; the gall-bladder contained ten drachms of dark-green moderately viscid bile. The pancreas was flesh-colored, and weighed two ounces and three-quarters. The spleen was pultaceous and of the color of elderberry juice; it weighed four ounces and three-quarters. The kidneys were much congested; the right weighed five ounces,

the left five and a half. The small intestine was healthy except in the lower third of the ileum, where Peyer's patches and the solitary glands were slightly elevated and whitened. The large intestine was contracted, the mucous membrane being in consequence thrown into tortuous folds; it was congested near the cæcum, and of a stone-gray color elsewhere.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 378.—Private Kinkin Clark, company C, 44th North Carolina volunteers; admitted October 20, 1863. Chronic diarrhœa. Died, October 24th. *Autopsy* twenty two hours after death: Apparent age 45; height five feet nine inches; rigor mortis slight; body not much emaciated. The brain was firm, and weighed fifty-one ounces and a half; there was but little fluid in the ventricles. The mucous membrane of the trachea was irregularly purplish in spots, between which it was pale. The lungs were engorged with venous blood, but crepitant throughout; the right lung weighed fifteen ounces and a half, the left fourteen ounces. The pericardium contained nine drachms of fluid. The heart was normal, and contained no clots except a very small one in the right ventricle. The liver weighed seventy ounces and a half; its substance was normal in color and consistence, except at the left extremity of the left lobe, where it was firmer than elsewhere, coated by old exudations, and attached to the spleen; the gall-bladder contained six drachms of bile resembling coffee-grounds. The spleen was firm, and weighed twenty-three ounces; it was of a pale grayish-blue externally, and of a dark-mulberry color internally; it was firmly agglutinated to the liver; the adhesion was extremely thick, and cut like cartilage. The pancreas was of normal consistence, and weighed four ounces. The kidneys were large; the right measured five inches by two and a half, and weighed seven ounces and a half; the left measured five inches by three, and weighed eight ounces; the cortical substance of both was pale but injected, the section appearing as if sprinkled with red pepper; the bases of the pyramids were of a very dark-purple color, the capsules readily elevated, the pelves highly injected. The mucous membrane of the small intestine was softened and of a stone-blue color, which increased in intensity toward the ileo-cæcal valve; the agminated glands were not elevated or thickened, but presented a few ulcers which varied from the size of a mustard-seed to that of a split-pea; the solitary glands were prominent, but not ulcerated. The ileo-cæcal valve was the seat of an irregular shallow ulceration. The cæcum was intensely congested, its solitary glands conspicuous and whitish; the mucous membrane of the rest of the large intestine was softened and of a pale yellowish-slate color.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 379.—Sergeant Benjamin Russell, company I, 13th Massachusetts volunteers; admitted October 24, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 13th Massachusetts volunteers, admitted September 24th—acute diarrhœa—sent to division hospital October 15th. He is borne on the register of the hospital of the 2d Division, 1st Corps, admitted October 19th—chronic diarrhœa—sent to general hospital October 24th.] Died, October 25th. *Autopsy* twenty hours after death: No rigor mortis; body much emaciated; apparent age 31; height five feet eight inches. The brain was healthy, and weighed forty-seven ounces. The mucous membrane of the trachea was readily torn; it was generally pale, but somewhat purplish between the rings. The right lung weighed twenty-nine ounces and a quarter; its upper lobe was hepatized posteriorly and presented at its apex a tubercular deposit about the size of a chestnut, in which there was a cavity partly filled with softened tubercular matter; the middle lobe was in the stage of gray hepatization; it was coated externally with a thick layer of lymph; the lower lobe was in the stage of splenization; a large amount of greenish frothy fluid exuded on pressure; the lobe was covered posteriorly with old adhesions. The left lung weighed twenty-two ounces and a half; its upper lobe contained a number of small vomicæ, the lower lobe was in the stage of gray hepatization. The pericardium contained seven drachms of fluid. The heart weighed six ounces and a half; its valves were healthy; the endocardium was of a dark-purple color; both cavities contained soft whitish clots and a considerable quantity of venous blood; the clot in the left side was larger than that in the right. The liver was healthy; it weighed forty-two ounces and a half; the gall-bladder contained an ounce and a half of dark-brown very viscid bile. The spleen weighed four ounces and a half; it was of a dark-mulberry color and rather friable. The pancreas was healthy, it weighed an ounce and three-quarters. Both kidneys were congested; the right weighed four ounces, the left four and a half. The small intestine was healthy, except that its walls were thin; Peyer's patches were not elevated. The large intestine from the rectum upward was extensively diseased; numerous small punctated ulcers were observed along the tract; the mucous membrane was thickened and irregularly covered by a fine granular exudation which was most abundant near the rectum; the cæcum was of a dull-slate color, the colon congested.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 380.—Private Samuel Ryckman, company C, 6th Michigan cavalry; admitted July 30, 1863. Chronic diarrhœa. Died, October 27th. *Autopsy* sixteen hours after death: Height five feet ten inches; no rigor mortis; emaciation extreme. The brain was somewhat soft; it weighed forty-seven ounces and a half. The mucous membrane of the trachea was pale. The right lung weighed fifteen ounces and three-quarters; its upper lobes were healthy, the lower lobe somewhat congested, and a tenacious mucus exuded from the bronchial tubes on pressure. The left lung weighed fourteen ounces and a half; in its apex was a mass of tubercle the size of a walnut, which was just beginning to soften; the lower lobe was in a state of venous congestion, the mucous membrane of its bronchial tubes inflamed; the bronchial glands were large, soft and black. The pericardium contained two drachms of fluid. The heart was healthy; it weighed seven ounces and a quarter. The liver was of firm consistence, pale-yellow color, and fatty; it weighed fifty-seven ounces and three-quarters; the gall-bladder contained ten drachms of bile. The spleen was firm, of a dark-mulberry color on section, and weighed ten ounces and a half. The pancreas weighed two ounces and three-quarters. The kidneys were slightly congested; the right weighed five ounces and a quarter, the left three and three-quarters. The upper portion of the small intestine was healthy; in the lower part of the ileum the mucous membrane was thin, soft, and congested; the valvulæ conniventes were almost obliterated; Peyer's patches were of a dull-slate color, but not prominent or ulcerated. The large intestine was extensively ulcerated from the cæcum to the anus; some of the ulcers were very deep, their outlines exceedingly irregular, their bases of a dark blue-stone color; no solitary glands were visible, and no diphtheritic membrane was present. In the transverse colon the ulceration was very superficial.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 381.—Corporal Charles P. Stevens, company B, 126th New York volunteers; age 33; admitted September 12, 1863. Chronic diarrhœa. Died, November 5th. *Autopsy* twenty-four hours after death: Height five feet nine inches; rigor mortis well marked; emaciation extreme; abdomen covered with numerous spots. The brain weighed forty-nine ounces; there was a drachm of fluid in the ventricles. The mucous membrane of the trachea was extremely pale. The right lung weighed twenty-four ounces; there were a few tubercles in the lower part of its upper lobe; the middle lobe was free from them, and they were numerous in the lower lobe, in which they were associated with intercurrent pneumonia, which in some parts had advanced to gray hepatization; the lower lobe of the left lung was in much the same condition; its upper lobe was free from tubercles; bronchitis was present on both sides, especially in the lower lobes. The pericardium contained six drachms of straw-colored serum. The heart and its valves were healthy; there was a small fibrinous clot in the right side, none in the left. The liver presented the nutmeg appearance, and weighed fifty ounces; the gall-bladder contained six drachms of dark reddish-brown bile. The spleen was quite firm, and weighed four ounces. The pancreas weighed two ounces. The kidneys were firm and rather pale; the right weighed four ounces, the left five. The walls of the small intestine were very thin; the mucous membrane was soft, the vessels congested. The mucous membrane of the large intestine was ulcerated; most of the ulcers were irregular in form, and blackish, with rather low abrupt walls; toward the cæcum they were small and punctated; wherever the mucous membrane remained intact, it was whitish and lardaceous in appearance, except near the rectum, where it was uniformly pink.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 382.—Private Thomas Shannon, company F, 42d New York volunteers; age 25; admitted September 12, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 24th New York volunteers, admitted August 24th—diarrhœa—sent to general hospital September 10th.] The patient stated that he had been sick four months; was extremely emaciated; his hair was dry and long; his eyes were dim, but ulceration of the cornea had not yet taken place; the skin was of a dull yellowish-slate color, and slightly furfuraceous; the abdomen was much depressed; the feet and toes were persistently cold, the toes bluish. About the 13th of October he began to sink rapidly, but with singular vitality he reacted from a condition bordering upon death, and for several weeks improved so greatly that hopes of his recovery were entertained. He subsequently became languid and exhausted, the diarrhœa became again more violent, and he died November 19th, at 7.30 A. M. *Autopsy* six hours after death: Height five feet nine inches; rigor mortis well marked; body much emaciated. The brain was healthy, and weighed fifty-seven ounces; the ventricles contained a drachm of serum; the quantity of subarachnoid fluid was larger than usual. The mucous membrane of the trachea was pale. The right lung was collapsed, and weighed eight ounces and a half; it contained an abundance of pigment and some softened tubercles at its apex; the left lung was also collapsed, and weighed nine ounces. The pericardium contained six drachms of serum. The heart was healthy, and weighed eight ounces; its right cavities contained a soft black clot, and a similar one was found in the left ventricle. The liver was of a pale-yellowish color, apparently fatty; it weighed fifty-five ounces and a half; the gall-bladder contained eight drachms of dark tar-like bile. The spleen was firm, of a reddish mahogany-color, and weighed eight ounces and a half. The kidneys were pale and anæmic; the right kidney weighed three ounces and a half, the left four and a half. The pancreas was hard and tallow-like; it weighed two ounces. Seven feet above the ileo-cæcal valve the mucous membrane of the small intestine assumed a granular appearance, which became more marked farther down, assuming more and more the characters of an exudation of lymph. The exudation was arranged on the surface of the valvulæ conniventes, or in lines parallel to them, for they were quite indistinct, and in some places entirely obliterated; toward the ileo-cæcal valve the deposit was yellowish, pultaceous, and resembled the false membrane in diphtheria; just above the ileo-cæcal valve, midway between the mesenteric attachment and Peyer's patches, there was an ulcer which had perforated the ileum and communicated with a perforating ulcer in the cæcum; between the two ulcers was a small cavity containing pus, which was bounded by the intestinal walls, the iliac muscle, and a portion of the great omentum, which had become adherent, and appeared to have prevented the extravasation of the intestinal contents into the abdominal cavity. The colon was ulcerated throughout.—Assistant Surgeon Harrison Allen, U. S. A. [Nos. 116 to 118, Medical Section, Army Medical Museum, are from this case. Nos. 116 and 117 are successive portions of the thickened ileum; the mucous membrane is coated with pseudomembrane, and presents a number of ulcers. In No. 117 the opening of the abscess above described into the ileum is seen. The corresponding portion of the cæcum was, unfortunately, not preserved. No. 118 is a portion of the colon of the same patient, which is greatly thickened, and coated with pseudomembrane.]

CASE 383.—Private William O. Pollard, company C, 44th North Carolina (rebel) volunteers; admitted October 25, 1863. Chronic diarrhœa. Died, November 19th. *Autopsy* next day: Height five feet ten inches; no rigor mortis. The brain was healthy, and weighed fifty-seven ounces. There were no pleuritic adhesions. The right lung weighed seventeen ounces, the left fifteen; the lower lobes of both were congested hypostatically. The pericardium contained four ounces of fluid. The heart weighed nine ounces; its right cavities contained a large flesh-colored clot, the left cavities a similar but smaller clot; the valves were healthy. The liver weighed fifty-seven ounces; its parenchyma was pale and not very firm, its capsule readily torn; the gall-bladder contained ten drachms of dark-green very viscid bile. The spleen weighed seventeen ounces; it was tolerably firm, and of a dark mahogany-color. The pancreas weighed three ounces. The kidneys were pale and flabby; the right weighed six ounces, the left seven. The large intestine was very much ulcerated, and presented the appearance commonly found in long-existing diarrhœa.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 384.—Private John Finch, company A, 47th North Carolina (rebel) volunteers; admitted October 25, 1863. Chronic diarrhœa. Died, November 26th. *Autopsy:* Apparent age 48; height five feet seven inches; some rigor mortis; body very much emaciated. The brain was apparently healthy, and weighed fifty-two ounces and a half; the ventricles contained two drachms of turbid serum tinged with blood. The trachea was slightly purplish toward its bifurcation, but pale elsewhere. The right lung weighed sixteen ounces; the posterior portion of its upper and the whole of its lower lobe were in the stage of red hepatization; the left lung weighed fifteen ounces; it was crepitant throughout; its bronchial tubes contained a pus-like secretion.

The pericardium contained a drachm of fluid. The heart was healthy; there was a small white clot in the right side, none in the left. The liver was dark-brown in color, of normal consistence, and weighed forty ounces; the gall-bladder contained ten drachms of molasses-colored viscid bile. The spleen was firm, of a dark mahogany color, and weighed four ounces and a half. The pancreas weighed two ounces. The kidneys were healthy; the right weighed three ounces, the left three and a half. The large intestine was extensively ulcerated, presenting the appearance of one large roughened ulcer.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 385.—Private Joseph Gerrold, company E, 10th Vermont volunteers; admitted November 23, 1863. Chronic diarrhœa. Died, November 29th. *Autopsy:* Height five feet eight inches; rigor mortis slight; body emaciated. The brain was healthy, and weighed forty-seven ounces; the ventricles contained two drachms of fluid. The epiglottis had a yellowish-pink color. The mucous membrane of the larynx was of a bluish cast; that of the trachea was purplish over the interspaces, whitish over the rings. The right lung weighed twenty-one ounces; the posterior portion of its upper and lower lobes was congested, the rest of the lung healthy; the left lung weighed twenty-four ounces; it was intensely congested, and the central portion of the base of its upper lobe was in the stage of red hepatization. The pericardium contained a drachm of bloody fluid. The heart and its valves were healthy; there was a large whitish clot in its right side extending into the pulmonary artery; in the left side there was a smaller clot of the same character. The liver was congested; the gall-bladder contained four drachms of slightly viscid brown-red bile. The spleen was seven inches long, by five and a quarter wide and three and a half thick; it had a dark purplish mahogany-color, and was very firm. The kidneys were pale, the left being paler than the right; the right kidney weighed six ounces, the left five and a half. The pancreas weighed two ounces. The small intestine was extremely congested; large intestine the same; the mucous membrane of the large intestine was of a dark-greenish color. The diagnosis recorded in this case was chronic diarrhœa, but none of the characteristic lesions of that disease were found. There was no ulceration, no intumescence of the solitary glands, &c. The patient died most probably of pneumonia.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 386.—Private Ephraim York, company C, 19th Maine volunteers; admitted November 23, 1863. Acute diarrhœa. Died, December 4th. *Autopsy* next day: Rigor mortis marked; body considerably emaciated; surface slightly jaundiced. The brain was healthy; it weighed fifty-three ounces; the lateral ventricles contained a drachm of fluid. The pharynx was in a state of chronic inflammation; the walls were much thickened, the constrictor muscles very pale, the mucous membrane of a dim yellowish-gray color; beneath it were numerous small abscesses about the size of peas. The epiglottis was thickened and slightly injected on its free anterior border. The mucous membrane of the larynx had the same color as that of the pharynx, except over the cricoid cartilage, where it was of a stone-blue color. The left side of the rima glottidis was tumid and coated by a whitish-yellow exudation, beneath which was an ulcer with ragged irregular edges; the base of the epiglottis on the same side also presented several ulcers, which had everted edges and were filled with a tenacious pus-like exudation; on the right side of the base of the epiglottis there was a small ulcer about the size of a buckshot; the superior borders of the chordæ vocales were also ulcerated, more extensively on the right than on the left side; these ulcers were comparatively superficial, and were coated by a whitish deposit of lymph. The mucous membrane of the trachea was yellowish-gray down to its bifurcation, where it was of an intense red. The right lung weighed twenty-seven ounces; it was very much congested, and filled with a sanguineous fluid, which poured forth on section, but crepitated on pressure everywhere; the left lung was in the same condition as the right, and weighed twenty-eight ounces. The pericardium contained an ounce and a quarter of yellow serum. The heart weighed eleven ounces; its right side contained a large, firm, fibrinous clot, with but little venous admixture; a smaller clot was found on the opposite side. The liver was firm, rather pale, and weighed forty-five ounces; the gall-bladder contained four drachms of bile. The pancreas was purplish and unusually thick. The spleen weighed twelve ounces. The right kidney weighed six ounces, the left seven ounces; both kidneys were of a dark-purple color, the pyramids being a shade or two darker than the cortical portion. The intestines were healthy, except that the lower part of the large intestine was congested.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 387.—Private Andrew Eckstine, company K, 52d New York volunteers; admitted November 23, 1863. Chronic diarrhœa. Died, December 6th. The immediate cause of death was supposed to have been imprudence in eating oysters. *Autopsy:* Height five feet one inch; rigor mortis not very well marked; body much emaciated. The brain was firm; its ventricles contained a drachm of fluid. The œsophagus was slightly purplish in its superior portion, of a greenish-ochre at the cardiac extremity. The larynx and trachea were pale. The right lung was congested, especially its lower lobe; it contained an excess of frothy bronchial secretion; the upper lobe of the left lung was in the same condition; the lower lobe was in the stage of gray hepatization. The pericardium contained two ounces of fluid. The heart was healthy; its right cavities were filled by a large venous clot, which extended into the pulmonary artery. The liver was firm, its acini well marked; there were many dark-brown spots on the surface of the organ and disseminated through its substance; the gall-bladder contained three drachms of dark-green very viscid bile. The spleen had a dark sienna-brown color and was quite firm; it measured four inches and a half by three. The pancreas was whitish and moderately firm. The cortical substance of the kidneys was pale, the pyramids injected. The small intestine was pale, anæmic, and had an ironed-out appearance; its solitary glands were conspicuous. The large intestine presented a great number of punctated ulcers, some of which were becoming confluent; the mucous membrane was of a lively red.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 388.—Private Joseph Harbaugh, company D, 6th Maryland volunteers; admitted November 23, 1863. Chronic diarrhœa and semi-gangrenous feet. [This man appears on the register of the regimental hospital of the 6th Maryland volunteers, then at Brandy Station, Virginia, admitted November 14th—typhoid fever—sent to general hospital November 23d.] Died, December 8th, at 6 P. M. *Autopsy* twenty-one hours after death: Height five feet eight inches; rigor mortis marked; body emaciated. The brain was healthy, and weighed fifty ounces; the ventricles contained a drachm of fluid. The mucous membrane of the trachea was injected. The right lung weighed twenty-four ounces; the anterior part of its upper and the whole

of the middle lobe were somewhat emphysematous; the posterior portion of the upper lobe was filled with an excessive amount of bronchial secretion, and inferiorly was in the stage of red hepatization; the lower lobe was engorged and of a dark-purple color, but crepitated under pressure; the left lung was healthy, but congested hypostatically; it weighed thirteen ounces. The pericardium contained ten ounces of fluid. The heart weighed ten ounces; its valves were healthy; the right cavities contained a large mixed clot. The liver was healthy, and weighed sixty-four ounces; the gall-bladder contained two and a half ounces of bile. The spleen was moderately firm, of a dark-purple color; it weighed eight ounces. The pancreas weighed three ounces. The kidneys were anæmic, their cortical substance unusually pale; the pyramids were also pale, but darker than the cortical substance; the right kidney weighed five ounces, the left six ounces. The large intestine presented the usual appearances of chronic diarrhœa; the ulcers were superficial, not confluent, and tinged with a delicate pink color; this condition extended some distance into the small intestine, the mucous membrane of which was congested, while the solitary glands were conspicuous and of a dark-purplish color; Peyer's patches were of a still darker color, but not elevated or ulcerated. [The condition of the feet is not recorded.]—Assistant Surgeon Harrison Allen, U. S. A.

Case 389.—Sergeant James H. Morse, company D, 8th Pennsylvania cavalry; admitted September 17, 1863. Quotidian intermittent fever and chronic diarrhœa. Died, December 15th. *Autopsy* seventeen hours after death: Height five feet five inches; no rigor mortis. The posterior parts of the meninges were considerably congested; the brain was firm, and weighed forty-eight ounces and a half; the ventricles contained a drachm of serum. The œsophagus was pale throughout; the larynx and trachea were also pale; at the bifurcation of the trachea there was a quantity of bronchial secretion. The right lung weighed twenty-three ounces; the anterior and superior portions of its upper lobe were healthy, the posterior and inferior portions hepatized; the lower lobe was partly carnified, partly splenified; the left lung was healthy, and weighed sixteen ounces. The pericardium contained five drachms and a half of fluid resembling the white of an egg. The heart weighed eleven ounces and a half; a very small whitish-yellow clot, the size of a horse-chestnut, was found in the right side, one of similar dimensions and appearance in the left side; the valves were healthy. The liver had the nutmeg appearance, was quite fatty, and weighed sixty-three ounces; the gall-bladder contained two ounces and a half of dark-green bile, in which there was considerable sediment of an intense green color. The spleen was somewhat softer than usual, of a dark-purple color, and weighed twelve ounces and a half. The pancreas was firm, white, and weighed three ounces. The kidneys were pale and apparently fatty; the right weighed six ounces, the left six and a half. The intestines were bound together and to the abdominal parietes by fibrinous bands; the mucous membrane of the small intestine was healthy to within two feet of the cæcum; Peyer's patches and the solitary glands were not prominent; the large intestine was ulcerated throughout, most of the ulcers being punctated; they were most marked along the longitudinal bands.—Assistant Surgeon Harrison Allen, U. S. A.

Case 390.—Private Peleg Mitchell, company D, 16th Maine volunteers; age 61; admitted October 19, 1863. Diarrhœa and erysipelas. This man was taken sick with diarrhœa near Fairfax Court-House, Virginia, October 16th. His bowels were moved from ten to fifteen times daily; his stomach was irritable. October 23d: The patient vomits continually; tongue coated with thick white fur; pulse 108 and scarcely perceptible; extremities cold. November 3d: Is much better; the vomiting has ceased and the diarrhœa is nearly checked. November 13th: The bowels have been quite regular for a day or so, but are loose again. He had rheumatic pains when admitted, which have now disappeared. December 14th: Facial erysipelas has set in and the diarrhœa has returned; the discharges are frequent; the abdomen is tender; pulse 110 and feeble. December 16th: The erysipelatous symptoms are better, but the patient is much prostrated; the diarrhœa continues. December 18th: The erysipelas has nearly subsided; the prostration continues; there is no pain, and the evacuations are involuntary but not very frequent. Died, December 19th. This patient had from six to eight ounces of milk-punch per day. *Autopsy* next day: Body not emaciated; adipose tissue quite abundant. Brain not examined. The lower lobes of both lungs were congested; the lungs otherwise were healthy. The heart was paler than natural. The liver had the nutmeg appearance to a slight degree. The pancreas was white and firm. The spleen was firm, very dark, and filled with black blood. The kidneys were congested. The mucous membrane of the ileum was perfectly healthy, and there was no enlargement of the closed glands. [The condition of the large intestine is not recorded.]—Assistant Surgeon Harrison Allen, U. S. A.

Case 391.—Private Samuel Hill, company F, 41st North Carolina (rebel) volunteers; admitted December 5, 1863. Chronic diarrhœa. [This man appears on the hospital register of the Old Capitol prison, taken sick October 28th with typhoid fever.] Died, December 21, 1863. *Autopsy* twenty-seven hours after death: There was some rigor mortis. The posterior part of the upper lobe of the right lung and the upper portion of the middle lobe were semi-splenified and friable, but did not sink in water; the rest of both lungs was normal. The pericardium contained five drachms of fluid. The heart was normal. The liver and kidneys were congested. The pancreas was whitish and moderately firm. The spleen small and firm. The ileum was very much congested, and presented some punctated ulcers. The large intestine was extensively ulcerated. The mesenteric glands were not enlarged.—Assistant Surgeon Harrison Allen, U. S. A.

Case 392.—Private William Jenkins, company C, 44th North Carolina (rebel) volunteers; admitted from Old Capitol prison October 20, 1863. Chronic diarrhœa. Died, December 31st. *Autopsy* twelve hours after death: Apparent age 21. The pharynx and larynx were healthy. The lungs were congested posteriorly; the middle lobe of the right lung was in a state of gray hepatization. The pericardium contained two ounces and a half of fluid. The heart was healthy. The liver was healthy. The spleen measured seven inches and a half by four; it was very firm. The pancreas was healthy. The kidneys were rather small and pale. The small intestine was healthy. The cæcum was somewhat congested. The ascending and transverse colon were not diseased; the descending colon and rectum were ulcerated and coated with a diphtheritic exudation.—Assistant Surgeon Harrison Allen, U. S. A.

Case 393.—Private Abraham Keller, company A, 6th Maryland volunteers; admitted November 23, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 6th Maryland volunteers, admitted October

22d—diarrhœa—sent to general hospital November 2d.] Died, December 31st. *Autopsy:* A number of lobules in the left lung were hepatized gray; the right lung was healthy. The deep-seated cervical lymphatic glands were tubercular, (no tubercle elsewhere.) The liver was hard and presented a number of whitish lardaceous spots. The spleen was small and firm. The ileum was healthy; the colon ulcerated. Assistant Surgeon Harrison Allen, U. S. A.

CASE 394.—Private F. Lehman, 39th company, 2d battalion Invalid Corps; admitted November 11, 1863. Chronic diarrhœa. Died, January 10, 1864. This man had been wounded in action before being transferred to the Veteran Reserve Corps. The ball entered his left shoulder, between the acromion and the head of the humerus. It was found, after death, embedded immediately beneath the skin an inch below the spine of the scapula. *Autopsy:* The liver was soft and friable. The spleen measured four inches and a quarter by three; it was soft and of a pale-red color. The intestines presented the usual lesions of chronic diarrhœa. The cæcum was greatly thickened and inflamed. The peritoneal surface of the colon was inflamed and coated with thick adhesive lymph.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 395.—Private Nathan Craft, company K, 53d North Carolina regiment, (Confederate;) admitted from Old Capitol prison January 6, 1864. Chronic diarrhœa. Died, January 11th. This patient had been sick a long time with the usual symptoms of chronic diarrhœa; toward the close he had pneumonia. *Autopsy* nine hours after death: The right lung was pneumonified, the left congested and filled with sero-sanguineous fluid. The colon presented the usual lesions of chronic diarrhœa, and the rectum was coated with an exudation of lymph. The abdominal cavity contained a quantity of serum, and a thin layer of lymph united the coils of intestine; the lymph was most abundant upon the colon. The sigmoid flexure was quite firmly adherent posteriorly to the peritoneum. The spleen was very soft, and measured four inches and a half by three.—Assistant Surgeon Harrison Allen, U. S. A.

CASE 396.—Private Peter Ball, company H, 66th New York volunteers; admitted December 29, 1863. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 66th New York volunteers, admitted December 8th—intermittent fever—sent to general hospital December 11th. No subsequent account of him is found prior to his admission to Lincoln hospital.] Died, January 24, 1864. *Autopsy* forty-eight hours after death: Height five feet eight inches; the body was much emaciated. The brain weighed fifty-three ounces; the subarachnoidal fluid was abundant; the pia mater was ecchymosed in spots; the lateral sinuses were full of blood. The right lung weighed thirty-two ounces; it was congested and marked, especially on its upper lobe, by streaks of black pigment corresponding to the ribs; the left lung weighed twenty-two ounces and a half; it also was congested and marked with pigment in the same manner as the right lung; the lower lobe appeared to be consolidated, but did not sink in water. The bronchial glands were black; some of them were hardened and contained calcareous deposits. The heart weighed six ounces and a quarter; its substance was flabby, the surrounding adipose tissue abundant; there was a large fibrinous clot in the left auricle; the aorta was reddened internally. The liver weighed forty-nine ounces and a half; its substance was finely mottled; the gall-bladder contained a little light-colored bile. The spleen weighed three ounces and a quarter. The pancreas weighed two ounces. The right kidney weighed six ounces, the left kidney six and a quarter. The mucous membrane of the upper part of the jejunum was congested and softened; the valvulæ conniventes were not prominent, and disappeared in the lower part of the jejunum, so that the ileum was quite smooth. The cæcum and ascending colon were ulcerated; the ulcers were more numerous in the transverse colon, where they penetrated to the peritoneum; they were generally grouped in rows corresponding to the longitudinal muscular bands; the ulcers in the sigmoid flexure were irregular and covered with shreddy lymph. The rectum was irregularly congested.

CASE 397.—Private William Smale, company E, 67th Pennsylvania volunteers; age 22; admitted February 3, 1864. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 67th Pennsylvania volunteers, then near Brandy Station, Virginia, admitted December 14, 1863—typhoid fever—sent to general hospital February 3, 1864.] Died, February 27, 1864. *Autopsy* fifteen hours and a half after death: Height five feet ten inches and a half; body very much emaciated. The brain was soft, but apparently healthy; it weighed forty-four ounces and a half. The larynx and trachea were healthy; there were firm pleuritic adhesions on both sides, and both pleura pulmonalis and costalis were coated with a thick layer of fibrinous exudation; the right pleural cavity contained ten ounces of serum, the left eight ounces. The left lung weighed twenty-four ounces; there was a small deposit of tubercles in the base of its upper lobe; the whole lung was considerably congested, and the anterior part of its lower lobe was carnified; it sank in water; the right lung weighed nineteen ounces and a half; it was moderately congested, but otherwise healthy. The heart was healthy; weight eight ounces and a half. The pericardium contained half an ounce of fluid. The liver was bronzed; there were a few patches of fibrinous exudation on the upper surface of its right lobe; it weighed sixty-nine ounces. The external surface of the spleen was covered with patches of fibrinous exudation; internally the organ was mahogany colored; it weighed eleven ounces and a half. The pancreas was healthy; weight five ounces. The left kidney weighed eight ounces and a half; its cortical substance was pale and fatty; the right kidney was similar to the left, and weighed seven ounces and a half. The small intestine was very much congested. The large intestine was also very much congested and greatly thickened, but there was no ulceration.

CASE 398.—Private Franklin McBeth, company E, 67th Pennsylvania volunteers; age 22; admitted February 3, 1864. [This man appears on the register of the regimental hospital of the 67th Pennsylvania volunteers, then near Brandy Station, Virginia, admitted November 14, 1863—typhoid fever; January 1, 1864, chronic diarrhœa is recorded—sent to general hospital February 3d.] Died, March 4, 1864. *Autopsy* twenty two hours after death: Height five feet six inches; body much emaciated. The brain was slightly congested, otherwise normal; weight forty-eight ounces and a half. The trachea and bronchial tubes were normal. The lungs were also normal, with the exception of slight congestion of the left lung; weight of right lung eight ounces and a half, left lung fifteen ounces; the left pleural cavity contained two ounces of bloody serum. The heart was healthy, its valves perfect; weight five ounces and a half. The pericardium contained two drachms of serum. The

liver was healthy; weight forty-five ounces; the gall-bladder contained an ounce of bile. The spleen was of a dark-mahogany color; weight three ounces and a half. The pancreas was healthy; weight three ounces. The kidneys were apparently healthy; weight of right kidney six ounces and a half, left kidney five and a half. The bladder was considerably distended with urine. The œsophagus was normal. The stomach was moderately congested, its mucous membrane thickened. The duodenum was congested, and Brunner's glands were enlarged. Portions of the mucous membrane of the jejunum and ileum were congested. The solitary glands and Peyer's patches were thickened and very prominent, but there was no ulceration. The mucous membrane of the large intestine was thickened throughout, and studded with ulcerations of small size, none exceeding the third of an inch in diameter; some had apparently cicatrized, some were in the process of healing, while others seemed recent and extending; these ulcers were least abundant in the upper portion of the large intestine, the cæcum being nearly free from them; they were most plentiful in the sigmoid flexure and the rectum; the mucous membrane between the ulcers was dotted over with numerous little patches of pseudomembrane, which adhered quite firmly. The appendix vermiformis was capacious, its mucous lining thickened and congested.

Case 399.—Private Greenleaf P. Foster, company K, 18th Massachusetts volunteers; age 36; admitted from the field February 3, 1864. Chronic diarrhœa. Died, March 4th, of delirium tremens. *Autopsy* eighteen hours after death: Height five feet six inches; rigor mortis well marked; body not much emaciated. The brain weighed forty-five ounces, and was apparently healthy; very little fluid was found in the ventricles. The lining membrane of the trachea was very much congested. There were numerous firm adhesions at the apex of the right lung; the lung weighed twenty-one ounces; it was very much congested throughout; in the posterior portion of its upper lobe there was a circumscribed patch about the size of a walnut, which was of a dark-mulberry color and sank in water; the left lung weighed twenty-one ounces; nearly the whole of its surface was coated by recent lymph, and the pleural sac contained forty-eight ounces of serum; the upper lobe of the left lung was congested, purple on section, and exuded a large amount of frothy fluid; the lower lobe was carnified. The pericardium contained an ounce and a half of fluid. The heart was apparently healthy, weight nine ounces; a large fibrinous clot was found in the right ventricle, and a very small venous clot in the left ventricle. The mucous membrane of the œsophagus was very pale. The stomach was well distended; its mucous membrane very soft and of a dusky-brown color. The intestines were much distended with gas; the mucous membrane of the duodenum and jejunum was of a very light color, nearly white; for about a foot of the upper part of the ileum, and about two feet of the lower portion, the mucous membrane was of a pinkish hue; the mucous membrane of the large intestine was of a dirty light-bluish color. The liver weighed seventy-one ounces; it was very friable; its capsule readily separated; its color a little lighter than natural. The pancreas was healthy, weight three ounces. The spleen weighed five ounces, was very firm, and of a light color. Both kidneys were healthy; the right weighed six ounces, the left seven ounces.—Acting Assistant Surgeon H. M. Dean.

Case 400.—Private Michael Weider, company G, 1st Maryland volunteers; age 40; admitted from the field March 25, 1864. Acute dysentery. Died, March 31st. *Autopsy* four hours and a half after death: Height five feet six inches; body very much emaciated. Brain not examined. The left lung was healthy, and weighed eleven ounces and a half; the right lung weighed twenty-five ounces; the base of its lower lobe was in the third stage of pneumonia; the rest of the lung was normal. The pericardium contained half an ounce of serum. The heart was normal, and weighed seven ounces. The stomach and small intestines appeared to be healthy, with the exception of the last thirty inches of the ileum, in which the membrane was very vascular and coated with pseudomembranous lymph. The whole length of the large intestine was extensively ulcerated; the ulcers varied in size from a quarter of an inch to an inch and a half in diameter; most of them penetrated to the muscular coat; between the ulcers the mucous membrane was coated with pseudomembrane in many places. The spleen was healthy, and weighed four ounces. The pancreas was healthy, and weighed two ounces. The kidneys were also healthy; the right weighed five ounces, the left four.—Acting Assistant Surgeon H. E. Paine.

Case 401.—Private Clarence C. Jenks, company A, 8th Illinois cavalry; age 29; admitted March 12, 1864. Intermittent fever. Died, April 4th, of epilepsy. *Autopsy* eighteen hours after death: Height five feet eleven inches; rigor mortis well marked; body somewhat emaciated. The brain weighed forty-nine ounces, and was quite soft. The right lung weighed twenty-three ounces and a half, the left sixteen and a half. The heart weighed eleven ounces. The pericardium contained two ounces of serum. The liver weighed seventy-five ounces and a half. The spleen weighed twenty-five ounces; the pancreas four ounces. The right kidney weighed seven ounces and a half, the left six and a half. The stomach was healthy. There were several patches of congestion in the small intestine, and in the last two feet of the ileum there were several ulcers in the process of cicatrization. Several cicatrizing ulcers were also observed in the colon, especially in the descending colon and sigmoid flexure; they varied from a line to half an inch in diameter.—Acting Assistant Surgeon H. M. Dean.

Case 402.—Private Andrew King, company A, 8th Illinois cavalry; age 44; admitted April 6, 1864. Acute gastro-enteritis. About ten days before admission this man began to suffer from a looseness of his bowels. At first the evacuations were large and fæcal in character, but rapidly became more fluid in consistence, and assumed a fetid odor and yellowish color. Very soon after, the stomach became so irritable that little could be retained. A few days before admission he had a chill followed by increased febrile action, cough, and pain in the right side of the abdomen; the frequent evacuations, inability to retain nutriment, and severe abdominal pain which prevented sleep for several nights, rapidly wasted his strength and flesh. On admission he complained of severe pain in the stomach and abdomen, great thirst for cold drinks, frequent desire to evacuate the bowels, the stools being liquid, fetid, and of a yellowish color; weakness, and inability to sleep. He had cough, which was accompanied by a slight expectoration of yellow tenacious mucus, but which did not annoy him much. The physical signs indicated solidification of the lower lobe of the right lung, more marked posteriorly. The respirations were 26, the pulse 120 and feeble; the surface was cold, the extremities purple; the tongue was dry, with a heavy brownish fur in the centre, its edges being red. Ordered a sinapism to the epigastrium, and a powder containing ten grains of subnitrate of bismuth, one of

powdered opium, and one of powdered ginger, to be given every two hours; two drachms of brandy in ice-water every hour. April 8th: The stomach will not retain anything; the bowels are moved about once every two hours; considerable griping precedes and attends the stools; he asks for cold water constantly, but instantly vomits it again. Ordered half a grain of sulphate of morphia by enema after each stool; turpentine stupes to the abdomen. To allay the irritability of the stomach lime-water, creasote, chloroform, dilute nitric acid, opiates, bits of ice, &c., were by turns carefully tried without effect. The severity of the symptoms gradually increased, the patient rapidly emaciated, and notwithstanding he took, by enema, nearly a grain of sulphate of morphia hourly, for the last forty eight hours of his life, sleep and freedom from pain could not be obtained. Died, April 11th, at 12 midnight. *Autopsy* nine hours after death: Rigor mortis marked; body considerably emaciated. The brain was normal, and weighed fifty-three ounces. The left lung was united to the thoracic walls throughout by old fibrous adhesions; it was healthy, and weighed fifteen ounces. The posterior portion of the lower lobe of the right lung and small portions of the upper and middle lobes were in the third stage of pneumonia, the rest of the lung healthy; the lung weighed forty-two ounces. The pericardium contained two ounces of serum. On the external surface of the heart near its apex was an opaque patch the size of a three-cent piece; the right auriculo-ventricular opening was somewhat dilated, four fingers being readily admitted; the walls of the left ventricle were somewhat thickened, but no valvular disease was discovered; the heart weighed fourteen ounces. The liver weighed seventy-seven ounces; the spleen seven; the pancreas three; the right kidney six, and the left seven and a half; all appeared to be normal. The mucous lining of the lower six inches of the œsophagus was eroded, fissured, and of a greenish-brown color, easily peeling from the subjacent connective tissue. The stomach was very vascular; its mucous membrane, which was of a dirty greenish-yellow color, was thickened, and presented numerous ecchymosed spots. The whole intestinal canal was very vascular, the vascularity increasing in intensity in the lower portion of the ileum, and thence to the anus; the lower two feet of the ileum and the whole of the large intestine were studded thickly with small recent ulcers, very few exceeding a pin's head in size.—Acting Assistant Surgeon William W. James.

CASE 403.—Private W. H. Gupton, company D, 44th North Carolina, (Confederate;) age 29; admitted December 17, 1863. Chronic diarrhœa. Died, April 21, 1864. *Autopsy:* Height six feet; body extremely emaciated. Brain not examined. Both lungs were adherent at their apices to the thoracic walls; there was considerable tuberculous solidification in the posterior part of the upper lobe and upper third of the lower lobe of the left lung; on section of the consolidated portion numerous small cavities were seen, which communicated with the bronchial tubes and with each other; they were filled with a yellowish somewhat fetid, purulent secretion, and were lined by a distinct smooth membrane; the superior lobe of the right lung was almost wholly solidified; at its apex was a cavity the size of a walnut, with several smaller ones communicating with it; these cavities closely resembled those in the opposite lung; the lower lobe was healthy; the right lung weighed twenty-four ounces, the left thirty ounces. The heart was healthy; weight eight ounces. The liver, spleen, pancreas, and kidneys were healthy; weight of liver fifty-three ounces; spleen ten ounces; pancreas two ounces; right kidney five ounces, left five and a half. The small intestine contained a considerable amount of tubercular (?) deposit, and was extensively ulcerated. In the large intestine were several ulcers, many in a state of cicatrization.—Acting Assistant Surgeon Henry E. Paine.

CASE 404.—Private Martin O'Conner, 39th company, 2d battalion Veteran Reserve Corps; age 57; admitted August 16, 1864. Chronic diarrhœa. Died, September 15th, of convulsions. *Autopsy* fourteen hours after death: The vessels of the brain were much congested; a small abscess, the size of a large pea, was found near the surface of the left hemisphere about an inch from the median line; with this exception the brain appeared to be normal. The trachea was lined with tenacious purulent sputa. The right lung weighed thirty-eight ounces; its lower lobe and the posterior portion of the upper lobe were in the stage of gray hepatization; the left lung weighed nineteen ounces. The heart weighed eight ounces and a half; its parenchyma and valves were normal; the right auricle contained a medium-sized fibrinous clot; no other clots were observed. The liver was of normal appearance, and weighed fifty-five ounces; the gall-bladder contained three ounces of molasses-colored bile. The spleen weighed five ounces and a half. The right kidney weighed five ounces, the left four and a half. The œsophagus was normal. [The condition of the rest of the alimentary canal is not recorded.]—Acting Assistant Surgeon H. M. Dean.

CASE 405.—Private James Long, company K, 4th New York artillery; age 37; admitted from the army of the Potomac August 24, 1864. Pleuro-pneumonia. Died, September 17th. *Autopsy* an hour and a half after death: The brain appeared to be normal. The right pleural sac was filled with serum mixed with pus, which coagulated on standing. The trachea was normal. The right lung was very much compressed, being about the size of the shut fist, and was covered by a thick layer of fibrin; on section it was found to be carnified, and a small abscess, about the size of a hazel-nut, was observed in its substance; it weighed ten ounces and a half; the left lung was apparently normal and weighed fifteen ounces. The œsophagus, stomach and small intestine were normal. The colon and cæcum were congested. The rectum was ulcerated in several places. The spleen weighed seven ounces and a half; its substance was firm. The liver weighed seventy-one ounces and a half; in its right lobe was an abscess about the size of a large hen-egg, the rest of the organ appeared to be normal; the gall-bladder contained twenty-two drachms of bile. Both kidneys appeared to be normal; the right weighed five ounces and a half, the left six and a half.—Acting Assistant Surgeon H. M. Dean.

CASE 406.—Private Harman Newton, 10th Massachusetts battery; age 35; admitted from the depot hospital of the 2d Corps July 30, 1864. Rheumatism and phthisis. The patient when received into the hospital was exceedingly debilitated: he was suffering with rheumatic pains in his lower extremities, and had also a severe cough, with free expectoration and diarrhœa. August 25th: Nausea and vomiting set in, followed by night-sweats and hectic fever. Died, September 1st, of phthisis.—Acting Assistant Surgeon G. C. Clarke. *Autopsy* five hours and a quarter after death: Height five feet nine inches; body very much emaciated, and covered with fine purpuric spots; no rigor mortis. The brain was normal, and weighed forty-six ounces and a half. There were firm pleuritic adhesions on the left side. The lower lobe of the right lung was considerably congested,

and on section a purulent fluid exuded from many of the small bronchial tubes; the middle and upper lobes were normal; there were several carnified spots about three-quarters of an inch in diameter in the lower lobe of the left lung, and on section a large quantity of frothy sanguineous fluid exuded; the upper lobe appeared to be normal; the right lung weighed twenty ounces, the left thirteen and a half. The heart was very small, weighing but five ounces and a half. The spleen weighed four ounces and a half. The liver was very much congested, and weighed forty-six ounces and a half. Both kidneys were congested; the right weighed four ounces and a half, the left five and a half. The œsophagus was normal. The cæcum and about three feet of the lower portion of the ileum were very much congested. At the sigmoid flexure of the colon there was an oval ulcer measuring two inches and three-quarters by two inches, its longest diameter being across the intestinal canal; its margin was very jagged and abrupt. There were several small ulcers in the lower portion of the rectum.—Acting Assistant Surgeon H. M. Dean. [No. 403, Medical Section, Army Medical Museum, is from this case; the specimen is the atrophied heart.]

Case 407.—Private Gilbert Keenholtz, company D, 7th New York artillery; age 37; admitted from Alexandria, Virginia, September 19, 1864. Chronic diarrhœa and hepatitis. [This man appears on the register of the Augur hospital, near Alexandria, Virginia, admitted September 11th—remittent fever—sent to general hospital September 19th.] The patient stated that he had been sick about four months; he was very yellow and anæmic. Died, September 23d.—Acting Assistant Surgeon C. H. Burgess. *Autopsy* five hours and a half after death: Height five feet six inches; rigor mortis well marked; body well nourished; skin icteroid. The brain appeared to be normal, and weighed forty-seven ounces; there was a larger amount of fluid in the subarachnoid space than usual. The trachea contained a considerable quantity of yellowish-white sputa. On section of the right lung an abundance of yellowish-white frothy fluid exuded; the left lung appeared to be normal; the right lung weighed fourteen ounces and a half, the left thirteen ounces. The heart weighed nine ounces; its valves were normal; there was a mixed clot in its right cavities, in the left a small vermiform fibrinous clot. The spleen weighed only three ounces; on section it had a granular appearance. The liver weighed seventy-two ounces and a half; its left lobe was entirely destroyed by abscesses; the right lobe contained two abscesses, one about the size of a goose-egg, the other about the size of a hen-egg. Both kidneys were slightly congested; the right weighed five ounces and a half, the left six and a half. The œsophagus, stomach, and small intestine appeared to be normal. In the cæcum there were several large ulcers, the longest diameter of which was transverse to the length of the intestine; the remainder of the large intestine was very much congested.—Acting Assistant Surgeon H. M. Dean.

Case 408.—Sergeant Frederick Brenner, company C, 15th New York artillery; age 50; admitted from the army of the Potomac October 7, 1864. Chronic diarrhœa. Died, October 10th. *Autopsy* ten hours and a half after death: Height five feet seven inches; rigor mortis well marked; body well supplied with fat. The brain weighed forty-three ounces. The lower lobes of both lungs were much congested, and a large amount of rust-colored frothy mucus exuded on section; the remaining lobes appeared to be normal; the right lung weighed twenty-one ounces, the left sixteen and a half. The heart and its valves were normal; it weighed eleven ounces; its right side contained a very large black clot, the left auricle a small one. The liver was congested, and weighed seventy-seven ounces; the gall-bladder contained seventeen drachms of very thick ropy bile. The spleen was light colored and soft; it weighed six ounces and a half. Both kidneys appeared to be normal; the right weighed six ounces, the left six and a half. The œsophagus, stomach and small intestine appeared to be normal. The mucous membrane of the large intestine was studded with ulcers, many of which were very deep.—Acting Assistant Surgeon H. M. Dean.

Case 409.—Private J. F. Chipman, company E, 36th Wisconsin volunteers; age 36; admitted from the army of the Potomac August 30, 1864. Gunshot wound of the back of the left hand. Died, October 17th, of purpura and exhaustion. *Autopsy* next day: Height five feet eight inches; no rigor mortis; body very much emaciated. The brain appeared to be normal, and weighed forty-seven ounces and a half. On the left side of the larynx was an ulcer which penetrated through the mucous membrane to the hyoid bone, which was roughened as if carious. The lower lobes of both lungs were very much congested, and on section a large amount of frothy fluid of a rust-color exuded, but no part of the lobes would sink in water; the remaining lobes were normal; the right lung weighed sixteen ounces and a half, the left fifteen and a half. The heart and its valves were normal; it weighed eight ounces and a half; its right cavities were filled with a large dark clot; the left auricle contained a medium-sized black clot, the left ventricle a small vermiform one. The skin of the abdomen was studded with spots about a line in diameter, which resembled those seen when gunpowder has been deposited beneath the integument; there was quite a large amount of straw-colored fluid in the abdominal cavity, and a deposit of lymph on the peritoneum. The liver weighed thirty-eight ounces; it was of a dull slate-color externally, and on section appeared to be anæmic; its acini were not well marked; the gall-bladder contained twelve drachms of bile. The spleen weighed seven ounces. The right kidney was normal and weighed three ounces and a half, the left four ounces; the cortical substance of the left kidney was dark colored. The stomach appeared to be normal. The mucous membrane of the small intestine was very much congested, and in the ileum there were quite a number of old ulcers, many of which penetrated to the muscular coat. The large intestine was studded with ulcers resembling those seen in the ileum.—Acting Assistant Surgeon H. M. Dean.

Case 410.—Private Chester Rasbeck, company A, 10th New York heavy artillery; age 20; admitted from regimental hospital September 28, 1864. Chronic diarrhœa and quotidian intermittent fever. [This man appears on the register of the regimental hospital of the 10th New York artillery, admitted January 13, 1864—small-pox—sent to small-pox hospital January 19th. He is borne on the register of the Kalorama small-pox hospital, Washington, D. C., admitted January 19th—variola—returned to duty January 25th. He again appears on the register of his regimental hospital, admitted January 26th—catarrh—returned to duty February 7th. No subsequent record of his case is found prior to his admission to Lincoln hospital.] The patient had violent chills every day for several days after admission, but they were controlled on the fourth day by the free use of quinine. He was also suffering from a profuse watery diarrhœa, having from fifteen to twenty stools daily. Quinine, astringents, and stimulants were employed without benefit. Died, October 26th.—Acting Assistant Surgeon W. E. Roberts. *Autopsy*

next day: Height five feet ten inches; body considerably emaciated. The brain was very firm; it weighed fifty-two ounces and a half. The larynx and trachea were normal. The lungs appeared to be normal when examined externally, but on section of their lower lobes a large amount of frothy rust-colored mucus exuded; the right lung weighed twenty-three ounces, the left twenty-seven ounces. The heart and its valves were normal; it weighed nine ounces and a half; its right side contained a large fibrinous clot; the left side was empty. The spleen was of a dark slate-color and very pulpy; it weighed fourteen ounces. The liver was of a dark-olive color. The kidneys were normal; the right weighed four ounces, the left four and a half. The large intestine was very much ulcerated. The rest of the alimentary canal was normal.—Acting Assistant Surgeon H. M. Dean.

CASE 411.—Private Andrew Kitchen, company D, 16th Michigan volunteers; age 18; admitted from the army of the Potomac September 20, 1864. Remittent fever. [This man appears on the register of the hospital of the 1st Division, 5th Corps, near Petersburg, Virginia, admitted September 9th—remittent fever—sent to general hospital September 16th. He appears on the register of the depot hospital of the 5th Corps, City Point, Virginia, admitted September 17th—intermittent fever—sent to general hospital September 19th.] Died, November 9th, of tetanus from intestinal irritation—(convulsions from meningitis?) *Autopsy* eleven hours and a half after death: Rigor mortis well marked; body much emaciated; the jaws more than ordinarily rigid. The membranes of the brain were much congested; on cutting through them about six ounces of fluid escaped; the brain-substance was softened, and the gray matter was in excess; each ventricle contained about two ounces of serum; the brain weighed forty ounces. The thoracic viscera were normal in appearance. The right lung weighed thirteen ounces and a half, the left thirteen ounces; the heart six ounces and a half. The stomach and small intestine were congested; the large intestine congested and ulcerated; the other abdominal viscera were normal. The liver weighed thirty ounces; the spleen four; the right kidney four, the left three and a half; the pancreas two and a half.—Acting Assistant Surgeon A. Ansell.

CASE 412.—Private Dominick Swartz, company K, 2d New York heavy artillery; age 49; admitted from the army of the Potomac November 14, 1864. Chronic diarrhœa. [This man appears on the register of the hospital of the 1st Division, 2d Corps, near Petersburg, Virginia, admitted October 29th—diarrhœa—sent to depot hospital November 5th. He appears on the register of the depot hospital of the 2d Corps, City Point, Virginia, admitted November 5th—diarrhœa—sent to general hospital November 12th.] Died, November 30th. *Autopsy* ten hours and a half after death: Rigor mortis well marked; body considerably emaciated. The brain was normal; weight fifty-five ounces; there was a larger amount of subarachnoidal fluid than normal, and the pia mater and arachnoid were semi-opaque. The larynx and trachea were normal. The upper lobe of the right lung was in the stage of gray hepatization, and was adherent to the thoracic parietes; the remaining lobes were normal; the right lung weighed twenty-two ounces; there were extensive pleuritic adhesions on the left side; the lower lobe of the left lung was very much congested, and some of its lobules were in the stage of red hepatization; the upper lobe was normal; the left lung weighed twenty-five ounces. The heart weighed nine ounces; the cavities of its right side were distended by a large mixed clot, which extended into the venæ cavæ and pulmonary arteries; the left side contained a small vermiform clot. The liver, spleen, and kidneys presented nothing abnormal; the liver weighed sixty-four ounces and a half; the spleen five and a half; the right kidney six and a half, the left six. The mucous membrane of the intestines was a little more vasular than usual, but presented no other evidence of disease.—Acting Assistant Surgeon H. M. Dean.

CASE 413.—Zachariah Trent, a teamster; age 40; admitted from the hospital at Giesboro' Point, Maryland, December 2, 1864. Consumption and œsophagismus. According to his own statement this man enlisted in the rebel service some three years ago, and served until a short time since, when he deserted at Lynchburg, Virginia, and entered the United States service as a driver. In 1860 he had measles, followed by a cough and expectoration, which continued for several months. Four years ago he was run over by a wagon, the wheel passing over his abdomen. He continued to suffer for some time from the effects of this injury. Of late he has had a cough, and for the last seven weeks difficulty of swallowing. At present his countenance is sallow, and he is much emaciated; he has some cough, with a moderate quantity of muco-purulent expectoration. There is dulness on percussion over the greater portion of the chest, but more marked in the axillary and subaxillary regions than in front. On auscultation, mucous and submucous rhonchus are heard over both lungs, with sibilant rhonchus in some portions. He complains a good deal of dysphagia, and is unable to swallow anything but small quantities of fluid. At times he is troubled with retching, ejecting an offensive yellow fluid; his bowels are regular, the urine normal in quantity; he lies indifferently on either side, but with the knees drawn up toward the chest; the abdomen is very tender on pressure. From the foregoing symptoms tubercular disease of the lungs was diagnosticated; but it was thought that there might also be a scirrhous affection of some portion of the alimentary canal. Efforts were made to administer fluid nutriment and stimulants, but without success. Died, December 5th.—Acting Assistant Surgeon T. S. Haynes. *Autopsy* the same day: Height five feet eight inches and a half; rigor mortis well marked; body very much emaciated; countenance of a light-bronze hue. The brain was normal, and weighed fifty ounces and a half. The mucous membrane of the pharynx was quite rough; the mucous membrane of the larynx and trachea was also very much roughened, apparently by minute ulcers. Both lungs were studded with tubercles from the size of a pin's head to that of a small pea. The heart and its valves were normal; it weighed seven ounces; its right side contained a very large black clot, the left side a very small amount of black blood. The liver, spleen, and kidneys were normal. The spleen weighed five ounces and a half; the liver seventy ounces; the right kidney four ounces and a half, the left five ounces. The mesenteric glands were very much enlarged and softened. There was tubercular ulceration of the small intestine and the cæcum.—Acting Assistant Surgeon H. M. Dean. [Nos. 426 to 432, Medical Section, Army Medical Museum, are from this case. No. 426 consists of the larynx, and part of the trachea with the thyroid body attached; the under surface of the epiglottis and the mucous membrane of the larynx and trachea present a number of superficial ulcers. No. 427 is a section of the upper lobe of the left lung infiltrated with small cheesy tubercles. No. 428 is from the upper portion of the jejunum; the specimen presents near its middle a large ulcer, the long diameter of which is transverse to the length of the intestinal canal; on the peritoneal surface opposite the ulcer there are a number of minute tubercles. No. 429 is taken from high up in the ileum, and presents

two similar ulcers. No. 430 is from just above the ileo-cæcal valve, and exhibits a slightly thickened Peyer's patch in which there are a number of small discrete ulcers and several small isolated ones, apparently seated in the solitary follicles. The villi are hypertrophied in this piece and in Nos. 428 and 429. No. 431 is a portion of the cæcum with the vermiform appendix; an irregular ragged ulceration surrounds the orifice of the appendix, the mucous membrane of which is ulcerated throughout; the cæcum presents several large irregular ulcers. No. 432 consists of the duodenum with the pancreas attached; a mass of enlarged mesenteric glands lies in front of the head of the pancreas; posteriorly a portion of the abdominal aorta may be seen, with a number of enlarged lymphatic glands adjoining.]

Case 414.—Private Amos Allen, company H, 105th Pennsylvania volunteers; age 21; admitted from City Point, Virginia, October 8, 1864. Acute diarrhœa. This case was complicated with pleuro-pneumonia. The patient was much emaciated. The diarrhœa was arrested by appropriate remedies, but the chest-symptoms proved fatal. The patient suffered but little pain. Died, December 8th.—Acting Assistant Surgeon A. M. Sherman. *Autopsy* eight hours after death: Height five feet eleven inches; rigor mortis not well marked; body considerably emaciated. The brain was normal; weight forty-two ounces and a half. The larynx and trachea were normal. The right pleural sac contained fourteen ounces of fluid and a considerable quantity of recently deposited lymph. The lower lobe of the right lung was hepatized, and had in its centre a cavity containing about two ounces of a quite black and very fetid fluid the odor of which was peculiar and almost intolerable; the other lobes were normal; the lung weighed twenty-five ounces; the lower lobe of the left lung was in the stage of red hepatization; the upper lobe was normal; the left lung weighed twenty-one ounces. The heart was normal; weight six ounces and a half; the left auricle contained a small black clot. The liver, externally and on section, was of a much darker color than usual; it weighed forty-nine ounces. The spleen weighed seven ounces and a half; the right kidney six ounces, the left four and a half; the right kidney was much congested. The œsophagus, stomach, and small intestine were normal, with the exception of three small ulcers in the lower portion of the ileum. The large intestine was studded with ulcers with sharp-cut edges and dark-brown bases.—Acting Assistant Surgeon H. M. Dean.

Case 415.—Private Albert McCann, company M, 32d Massachusetts volunteers; age 24; admitted from City Point, Virginia, December 16, 1864. Consumption. [This man appears on the report of the regimental hospital of the 32d Massachusetts volunteers as taken sick November 3d—remittent fever—sent to division hospital November 23d. He is borne on the register of the hospital of the 1st Division, 5th Corps, as admitted November 23d—diarrhœa—sent to depot hospital December 6th. He appears on the register of the depot hospital of the 5th Corps, City Point, Virginia, as admitted December 7th—debility—sent to general hospital December 15th.] Died, December 20th. *Autopsy* two hours after death: Rigor mortis not very well marked; body considerably emaciated. The brain weighed fifty-two ounces; there was a large quantity of sub-arachnoidal fluid; the meninges were semi-opaque from a slight deposit of lymph. The larynx and trachea were healthy. There were pleuritic adhesions on both sides. The right lung was normal in appearance, and weighed fourteen ounces and a half; the left lung weighed eleven ounces and a half; its bronchial tubes were inflamed. The heart weighed five ounces and a half and contained no clots; its valves were healthy. There were evidences of extensive peritonitis. The spleen was congested, its external surface covered with a deposit of lymph; it weighed six ounces and a half. The liver was excessively congested, and on incision a large amount of black blood exuded; it weighed forty-two ounces. Both kidneys were congested; the right weighed four ounces, the left four ounces and a half. The mucous membrane of the large and small intestines was very much congested.—Acting Assistant Surgeon H. M. Dean.

Case 416.—Private Lindsey Morris, company A, 140th Pennsylvania volunteers; age 20; admitted from the depot hospital of the 2d Corps, City Point, Virginia, November 14, 1864. Chronic diarrhœa and debility. This man was taken sick October 20, 1864. At the time of admission he was very much exhausted; extremely emaciated; had no appetite; pulse 110 and weak: urine scanty and light colored; bowels loose. Treatment: Quinine, beef-tea, and brandy. November 19th: He was attacked with vomiting, ejecting a greenish acrid fluid. Applied a blister to the epigastrium, and directed him to take, every four hours, a powder containing two grains of calomel, half a grain of opium, one and a half of quinine, and four of prepared chalk. November 24th: The vomiting still continues. Ordered enemata of quinine and beef-tea three times daily. December 1st: The abdomen is so tender that peritonitis is diagnosticated, and warm fomentations applied to the abdomen. December 4th: The patient lies constantly on his back; pulse 90 and weak. December 6th: Eight abscesses were recognized on the front of the abdomen, and being opened discharged freely. The discharge was kept up by warm poultices; at the same time the injections of beef-tea and quinine were continued, as the patient was still unable to keep anything on his stomach. December 10th: The discharge from the abscesses is lessening. Continued the warm applications over the abdomen. Died, December 22d. From the time this patient was admitted till his death there was constant nausea and vomiting; during the last few days the injections were not retained.—Acting Assistant Surgeon E. B. Harris. *Autopsy* sixteen hours after death: Rigor mortis well marked; body very much emaciated. On the surface of the abdomen there were a number of small punctures which led to little abscess cavities, none of which extended beneath the external oblique muscle or its tendon. The brain weighed forty-seven ounces and a half. The larynx, trachea and lungs were normal. The right lung weighed eighteen ounces, the left nine and a half. The heart was normal, weight nine ounces and a half; each ventricle contained a very small fibrinous clot. The spleen was normal. The liver weighed forty-nine ounces and a half; it was very much congested, and on section a large amount of dark blood exuded; the gall bladder contained four ounces of very dark viscid bile. Both kidneys were apparently normal in texture, but large; the right weighed nine ounces and a half, and the left ten ounces. The lining membrane of the œsophagus was slightly congested, but the stomach appeared to be normal. Throughout the whole length of the small intestine the mucous membrane appeared to be inflamed, and in the lower half of the ileum it was studded with ulcers about a line in diameter. The mesenteric glands appeared to be perfectly normal, varying from the size of a pea to that of a very small almond. [The condition of the large intestine is not recorded.]—Acting Assistant Surgeon H. M. Dean.

CASE 417.—Private William Lloyd, company H, 48th Pennsylvania volunteers; age 27; admitted from City Point, Virginia, January 7, 1865. Chronic diarrhœa. [This man appears on the register of the hospital of the 2d Division, 9th Corps, admitted December 2, 1864—diarrhœa—sent to depot hospital December 7th. He is borne on the register of the depot hospital of the 9th Corps, City Point, Virginia, admitted December 7th—chronic diarrhœa—sent to general hospital January 5, 1865.] Died, January 11th. *Autopsy* fifteen hours after death: Height five feet four inches and a half; rigor mortis well marked; body much emaciated. The brain weighed forty-four ounces; its meninges were opaque, and there was a much larger quantity of subarachnoid fluid than normal. The larynx and trachea were normal. There were firm, but apparently recent, pleuritic adhesions on the left side. Both lungs were much congested, and weighed nineteen ounces each. The heart weighed seven ounces and a half; its right cavities contained a large opaque fibrinous clot; the left side contained a small vermiform clot. The spleen was light colored, and weighed but two ounces and a half. The liver appeared to be normal, and weighed fifty-five ounces and a half. The kidneys weighed four ounces each. The œsophagus, stomach and small intestine were normal, with the exception of the lower portion of the ileum, where Peyer's patches presented the shaven-beard appearance, and the mucous membrane was much congested. In the large intestine the mucous membrane was entirely destroyed by ulceration, some of the ulcers penetrating to the peritoneum.—Acting Assistant Surgeon H. M. Dean.

CASE 418.—Private James Pilock, company B, 20th Indiana volunteers; age 18; admitted from the depot hospital of the 2d Army Corps, City Point, Virginia, December 16, 1864. Chronic dysentery. Treatment: Tonics, alteratives, and counter-irritants. Died, January 12, 1865.—Acting Assistant Surgeon John Morris. *Autopsy* five hours after death: Height five feet seven inches; body rigid and very much emaciated. The larynx and trachea were normal. Both lungs were firmly adherent to the diaphragm, and presented evidences of slight bronchitis in their lower lobes; the right lung weighed eight ounces, the left eleven. The heart weighed six ounces and a half; its right side contained a very large fibrinous clot, the left side a long vermiform one. The liver, spleen, and kidneys appeared to be normal; the liver weighed fifty-one ounces and a half; the spleen five ounces; the kidneys four ounces each. The lower part of the small intestine was very much congested; a diverticulum, two inches long and half an inch in diameter, was found five feet and a half above the ileo-cæcal valve. The mucous membrane of the large intestine was studded with ulcers.—Acting Assistant Surgeon H. M. Dean.

CASE 419.—Sergeant Robert Smith, company C, 8th Maryland volunteers; age 23; admitted from the depot hospital of the 5th Corps, City Point, Virginia, January 18, 1865. Chronic diarrhœa. Died, January 20th. *Autopsy* the same day: Height five feet ten inches; rigor mortis well marked; body much emaciated. The brain weighed fifty-one ounces. The mucous membrane of the trachea and bronchial tubes was much congested, and of a dull-pink hue. Both lungs were considerably congested; the right lung weighed thirteen ounces, the left nineteen ounces. The heart weighed eight ounces. The spleen was normal, and weighed eight ounces. The liver was congested, quite a large amount of black blood exuding on section; it weighed fifty-three ounces. The kidneys appeared to be normal; the right weighed six ounces and a half, the left seven and a half. The œsophagus, stomach and duodenum appeared to be normal. The mucous membrane of the rest of the intestine was of a dark-red color, but no ulcers were observed.—Acting Assistant Surgeon H. M. Dean.

CASE 420.—Corporal Clem P. Johnson, company D, 140th Indiana volunteers; age 30; admitted as a convalescent from the general hospital at Jeffersonville, Indiana, March 1, 1865. Chronic diarrhœa. Died, March 9th, of pleuro-pneumonia. *Autopsy* nine hours after death: Height five feet eight inches; body considerably emaciated. The larynx was œdematous and somewhat congested. The right pleural cavity contained fourteen ounces of serum, the left pleural cavity ten ounces. There were pleuritic adhesions on both sides, which appeared to be old on the left side, recent on the right. The right lung weighed thirty-seven ounces; it was almost completely hepatized; in its upper lobe there were a number of purulent deposits; the left lung weighed thirty-four ounces and a half; its upper lobe was hepatized, its lower lobe congested. The heart weighed nine ounces; there were fibrinous clots in both ventricles. The pericardium did not contain an unusual amount of fluid. The liver weighed eighty-seven ounces, but was normal in appearance. The spleen weighed thirty-nine ounces and a half. The jejunum was somewhat congested in three or four places; the ileum congested, and in its lower part ulcerated. The ileo-cæcal valve was ulcerated, and dark colored, as if gangrenous. The upper part of the colon was ulcerated, lower down it presented nothing abnormal. The kidneys and pancreas appeared to be healthy.—Acting Assistant Surgeon E. B. Harris.

CASE 421.—Private Frank Hart, company I, 53d Pennsylvania volunteers; age 47; admitted from the depot hospital of the 2d Corps, City Point, Virginia, January 7, 1865. Chronic diarrhœa. Died, March 16, 1865, of pneumonia. *Autopsy* seventeen hours after death: Height five feet four inches; body much emaciated. The mucous membrane of the larynx and trachea was normal. The right lung weighed twenty-eight ounces; the posterior part of the upper lobe and the upper part of the lower lobe were in a state of congestion approaching red hepatization; the left lung weighed twelve ounces, and was normal; the right pleural sac contained four ounces of fluid, the left pleural sac five ounces. The mucous membrane of the stomach was slightly congested; that of the intestines decidedly so, the congestion increasing in intensity toward the lower part of the canal. The lower part of the ileum was slightly ulcerated. The coats of the large intestine were thickened, and the gut was very much contracted. The liver weighed eighty ounces and a half; the spleen three ounces; the kidneys three ounces each.—Acting Assistant Surgeon E. B. Harris.

CASE 422.—Private Robert F. Kineard, company B, 11th North Carolina regiment, (Confederate;) age 15; admitted from City Point, Virginia, April 24, 1865. Chronic diarrhœa. Taken sick April 6th, at Sailor's Creek. Died, May 3d. *Autopsy* the same day: There were slight pleuritic adhesions on both sides. Both lungs were congested; a cavity about one inch in diameter, and with firm walls, was found in the apex of the right lung. The small intestine was congested; the entire colon extensively ulcerated.—Acting Assistant Surgeon J. P. Arthur.

CASE 423.—Private Martin K. Hendrick, company G, 16th Maine volunteers; age 43; admitted from the depot hospital of the 5th Corps, City Point, Virginia, May 5, 1865. Acute diarrhœa. Died, May 11th. *Autopsy* the same day: All the thoracic

and abdominal viscera were healthy, except the intestines, particularly the large intestine, which was very much ulcerated throughout its entire length.—Acting Assistant Surgeon J. P. Arthur.

CASE 424.—Private Jackson Crowley, company H, 15th New York engineers; age 29; admitted from field hospital June 13, 1865. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 15th New York engineers as having been treated for diarrhœa from May 26th to June 13th.] Died, July 5th, of diphtheria. *Autopsy* the same day: Body not emaciated; throat much swollen, and dark colored externally. The epiglottis, larynx, and trachea as far as its bifurcation, were inflamed, congested, and in some places coated with false membrane, in others ulcerated. No other abnormal appearances were observed. [It does not appear that the abdominal viscera were examined.]—Acting Assistant Surgeon E. A. Van Nort.

The notes of the next five cases were forwarded, with the specimens, to the Army Medical Museum from CARVER HOSPITAL, Washington, D. C., Surgeon Oliver A. Judson, U. S. V., in charge:

CASE 425.—Private Granville Vanwagner, company D, 126th Ohio volunteers; admitted from the field hospital, army of the Potomac, July 4, 1864. Typhoid fever. [This man appears on the register of the regimental hospital of the 126th Ohio volunteers, admitted June 25th—fever—sent to depot hospital June 29th. He is borne on the register of the depot hospital of the 6th Corps, City Point, Virginia, admitted—bronchitis—sent to general hospital July 3d.] He was very much emaciated, and was suffering from symptoms resembling typhoid fever. His tongue was covered with a thick, dry, brown fur; teeth with dark sordes; bowels tympanitic. Petechiæ were observed on the chest and the upper portion of the abdomen. There was tenderness on pressure in the right hypochondriac region. The surface of the body was dry, but there was little abnormal heat. The diarrhœa was quite severe, but the stools were feculent, and contained no blood or mucus. After a few days the diarrhœa abated somewhat, the tongue appeared moist, and there seemed to be a decided improvement in the condition of the patient. July 25th: The diarrhœa became aggravated, the tongue again dry and dark colored. The patient became delirious, and died July 30th. The treatment consisted in the free use of turpentine emulsion, together with opium and tannic acid to check the diarrhœa. Brandy and sulphate of quinia was also given freely. The diet consisted of boiled milk, gruel, &c. *Autopsy* six hours after death: Body greatly emaciated; rigor mortis not marked. There were old pleuritic adhesions on both sides. The lungs were normal, with the exception of some slight congestion at the apex of the right lung. The pericardium contained two ounces of pinkish serum. The heart was normal and contained no clots. The liver was enlarged and pale; the gall-bladder nearly filled with bile. The spleen was dark colored, and measured eight inches by four, but appeared firm. The stomach was dilated and flabby; its mucous membrane thickened and softened. The solitary follicles of the jejunum were slightly enlarged; those of the ileum were enlarged to the size of pin-heads. The mucous membrane of the ileum was thickened and softened, and Peyer's glands were congested but not elevated. The colon was distended and thin; in the ascending colon were a number of ulcers; in the transverse colon, which made a bend downward toward the pubes, large ulcers with ragged edges were seen, some of which extended through the muscular coat; these ulcers increased in size toward the sigmoid flexure.—Acting Assistant Surgeon O. P. Sweet. [Nos. 416, 417, and 418, Medical Section, Army Medical Museum, are from this case. No. 416 is a portion of the ileum taken from just above the ileo-cæcal valve, with slight enlargement of the solitary follicles. No. 417 is a portion of the transverse colon of the same patient, which is quite thin, and presents a number of irregular oval ulcers. No. 418 is a portion of the descending colon, also quite thin, and presenting numerous ulcers which have coalesced, forming large erosions, which in several places penetrate to the peritoneum.]

CASE 426.—Private Peter Quackenbush, company E, 111th New York volunteers; age 48; admitted from the depot hospital of the 2d Army Corps, City Point, Virginia, July 5, 1864. Chronic diarrhœa. The patient had a senile look, and was considerably emaciated; pulse about 80; tongue moist but covered with a gray fur; anorexia; severe diarrhœa. He continued about the same until July 10th, when he began to improve, the diarrhœa being somewhat checked and his appetite better. July 26th, he was attacked by a severe pain in the right side, with dulness on percussion, and other evidence of pleurisy with effusion. The diarrhœa now became aggravated, the anorexia returned, and the patient died August 1st. Treatment: Opiates and astringents were freely given to relieve the diarrhœa, and stimulants were administered from the first. When pleurisy set in a blister was applied to the right side of the chest. Diet: Milk, beef-essence, &c. *Autopsy* four hours after death: The left lung was bound firmly to the chest by old pleuritic adhesions; its lower lobe was greatly congested; pleuritic adhesions, which seemed quite recent, existed also on the right side; the posterior portion of the right lung was in a state of hypostatic congestion; the right pleural cavity was about half full of fluid. The heart appeared to be normal; a partially washed clot was found in its right side; the pericardium contained about three ounces of fluid. The liver was enlarged, pale, and apparently fatty; the gall-bladder was filled with viscid bile. The spleen was enlarged and very soft. The kidneys were of about the normal size; their cortical substance appeared very pale. The mucous membrane of the stomach was thickened and congested; that of the small intestine was also congested, especially within three feet of the ileo-cæcal valve, where Peyer's patches were considerably thickened and presented a spongy appearance at their centres. In the ascending colon there were several large ulcers with ragged edges, which contained a quantity of black pigment; the mucous membrane was considerably thickened and softened; in the transverse colon these ulcers were less numerous and smaller; in the descending colon they again became larger.—Acting Assistant Surgeon O. P. Sweet. [Nos. 353 to 355, Medical Section, Army Medical Museum, are from this case. No. 353 is a portion of the ileum taken just above the ileo-cæcal valve, showing a slightly thickened Peyer's patch and some tumefaction of the solitary follicles. No. 354 is a portion of the ascending colon, presenting a number of oval ulcers with abraded edges, varying from the size of a pin-head to that of a five-cent piece. No. 355 is a portion of the transverse colon, presenting a number of minute follicular ulcers.]

CASE 427.—Private Walter Butler, company B, 56th Massachusetts volunteers; admitted from the field hospital of the 1st Division, 9th Corps, July 5, 1864. Typhoid fever. The patient was considerably emaciated; petechiæ were seen on his abdomen; his tongue was thickly coated in its centre with a dark fur; pulse about 120 per minute; slight diarrhœa. These symptoms seemed to yield readily to the ordinary treatment of typhoid fever. About July 20th, he was able to walk about the ward, slowly convalescing. From imprudence in eating and drinking he was again, July 25th, attacked with severe diarrhœa, which caused him to sink rapidly. He had now anorexia; red, dry tongue; pulse about 80. Treatment: Opiates and astringents to relieve the diarrhœa; brandy. Diet: Boiled milk, beef, beef-essence, &c. He became greatly emaciated, and died August 2d. *Autopsy* four hours after death: Emaciation great; rigor mortis slight. The right pleural cavity was obliterated by old adhesions; the areolar tissue in the anterior mediastinum was emphysematous. The lungs contained much black pigment, and their upper portion was congested. The right side of the heart contained a large fibrinous clot which adhered firmly to the tricuspid valve; there was no clot in the left side; the valves were healthy; the pericardium contained half an ounce of fluid. The liver appeared to be normal; the gall-bladder was nearly filled with bile. The spleen was about the normal size, pale, and very firm. The kidneys were normal. The suprarenal capsules were dark colored. The walls of the stomach were thin and pale. The small intestine appeared healthy down to about the middle of the ileum, below which the glands of Peyer were congested, the congestion increasing in intensity downward; the solitary follicles of the lower portion were enlarged. The mucous membrane of the transverse colon was thickened and softened, the thickness greatly increasing in the descending colon, sigmoid flexure, and rectum; the thickened membrane presented a peculiar spongy appearance; there were follicular ulcers throughout the colon, which, in the transverse colon especially, had coalesced into large eroding excavations.—Acting Assistant Surgeon O. P. Sweet. [Nos. 356 to 359, Medical Section, Army Medical Museum, are from this case. No. 356 is a portion of the ileum, with pin-head enlargement of the solitary follicles and two very slightly thickened Peyer's patches. No. 357 is from the ascending, No. 358 from the transverse, and No. 359 from the descending, colon; in these specimens the intestinal walls are somewhat thickened, and there are numerous follicular ulcers, which, in the transverse colon especially, have extended into irregularly oval excavations exposing the muscular coat; between the ulcers there is some adherent pseudomembrane.]

CASE 428.—Private Marvin Kellogg, company G, 2d New York heavy artillery; age 33; admitted from the depot hospital of the 2d Corps, City Point, Virginia, August 21, 1864. Chronic diarrhœa. The patient was greatly emaciated and had a jaundiced look. He had a severe diarrhœa, amounting to fifteen or twenty dejections during the twenty-four hours; his pulse was weak and easily compressed; his tongue was moist and thinly coated with gray fur. He continued in about this condition till August 25th, when the fæcal discharges became very frequent and involuntary. Treatment: Opiates and astringents, pills of opium and nux vomica, opiate enemata, &c.; brandy as a stimulant. Diet: Milk, chicken, beef-tea, beef-essence, &c. He died August 28th. *Autopsy:* Rigor mortis great; body greatly emaciated; there was a large collection of sordes on the teeth. The lungs were normal. The right side of the heart contained a fibrinous clot, the left side was filled with dark blood; the valves were healthy; the pericardium contained about two ounces of fluid. The liver was slightly enlarged and congested; the gall-bladder was filled with viscid bile. The spleen was dark colored, small and firm. The mucous membrane of the stomach was congested and red, presenting signs of severe inflammation about the cardiac orifice; the pyloric end of the organ was greatly contracted, the mucous membrane being thrown into large folds. The agminated glands in the lower portion of the ileum were congested, the congestion increasing, and dark spots appearing on the mucous membrane near the ileo-cæcal valve. The mucous membrane of the colon was congested, thickened and roughened with pseudomembrane; in the lower portion of the descending colon there were a number of small ulcers.—Acting Assistant Surgeon O. P. Sweet. [Nos. 401 and 402, Medical Section, Army Medical Museum, are from this case. No. 401 is a portion of the ileum, No. 402 of the descending colon. The mucous membrane of both is coated with pseudomembrane; in the colon there are a number of small follicular ulcers.]

CASE 429.—Private William H. Brookhall, company I, 26th Michigan volunteers; admitted from the depot hospital of the 2d Corps, City Point, Virginia, August 30, 1864. Acute dysentery. At the date of admission the patient was not greatly emaciated. He had been ill but a few days. His pulse was rapid; tongue covered with a dark dry fur. He had anorexia, frequent alvine dejections, which consisted chiefly of mucus and blood, and almost constant tenesmus. The disease progressed unchecked, and, September 5th, great gastric uneasiness set in; the stools were about ten or fifteen during the twenty-four hours, and contained large quantities of mucus and blood, which emitted a very offensive odor; there was severe pain in the abdomen, and continual tenesmus. September 8th: All the symptoms are aggravated; there are involuntary discharges of large quantities of bloody mucus; raving delirium has set in; the pulse is very feeble. The treatment consisted in the free administration of alcoholic stimulants, astringent and opiate enemata, with full doses of opium given at bed-time, &c. The diet consisted of milk, beef-tea, &c. He died September 9th. *Autopsy* eight hours after death: Emaciation slight; rigor mortis well marked. The right lung was slightly bound to the walls of the chest posteriorly by old adhesions; both lungs appeared to be normal. The pericardium contained two ounces of fluid. The right side of the heart contained a large fibrinous clot, the left side was empty; the valves appeared to be healthy. The liver was enlarged, soft and pale; the gall-bladder distended with bile. The spleen was enlarged, firm and of a dark slate-color. Both the cortical and medullary portions of the kidneys were pale, but the organs were normal in size. The mesenteric glands were enlarged. The stomach was dilated and flabby; its mucous membrane thickened and softened. The jejunum was healthy; in the ileum the mucous membrane was congested and dark colored, and its solitary follicles were enlarged, especially near the ileo-cæcal valve. In the large intestine the mucous membrane and the submucous cellular tissue were gangrenous; in the ascending colon the sloughs, of dark color and fetid odor, were separating, or had already separated, leaving the circular fibres of the muscular coat in view; in the transverse and descending colon the mucous membrane had nearly all sloughed away, and in places the sloughs appeared to extend nearly or quite through the muscular coat.—Acting Assistant Surgeon O. P. Sweet. [No. 409, Medical Section, Army Medical Museum, is from this case. It is a portion of the descending colon, showing large irregular diphtheritic ulcers which expose the muscular coat; the sloughing pseudomembrane hangs in shreds from the edges of the ulcers.]

The notes of the next four cases were forwarded, with the specimens, to the Army Medical Museum from EMORY HOSPITAL, Washington, D. C., Surgeon Nathaniel R. Moseley, U. S. V., in charge:

CASE 430.—Private Baldas Dill, company I, 1st Maryland volunteers; age 22; admitted from the field hospital of the 2d Division, 5th Army Corps, September 20, 1864. Chronic diarrhœa. Treatment: Astringents and stimulants. Died, September 23d. *Autopsy* same day: The colon and rectum were soft and ulcerated, the ulcers presenting a dark-greenish base; the mucous membrane between them was coated with pseudomembrane in patches. [There is no record of the condition of the other organs.]—Surgeon Nathaniel R. Moseley, U. S. V. [Nos. 367 and 368, Medical Section, Army Medical Museum, are from this case. No. 367 is a portion of the transverse, No. 368 of the descending, colon; both are somewhat thickened, and have had the greater part of their mucous membrane destroyed by large diphtheritic ulcers.]

CASE 431.—Private John Ordikirk, company K, 8th New York heavy artillery; age 16; admitted from the depot hospital of the 2d Corps, City Point, Virginia, September 15, 1864. Chronic diarrhœa. The patient was very weak and much emaciated. Ordered him to be kept at rest, and prescribed alteratives and astringents. There was some little improvement up to the 19th, when the stools became more frequent and the patient much weaker. Directed brandy and scalded milk; continued the astringents. Died, October 2d. *Autopsy* next day: The solitary follicles of the ileum were enlarged to the size of pin-heads, and some of them were ulcerated at their apices. In the large intestine there were numerous small follicular ulcers, between which the mucous surface was frosted with pseudomembrane. [There is no record of the condition of the other organs.]—Acting Assistant Surgeon W. H. Combs. [Nos. 395 to 397, Medical Section, Army Medical Museum, are from this case. No. 395 is a portion of the ileum, with the ileo-cæcal valve and part of the cæcum. The solitary follicles in the ileum are enlarged to the size of pin-heads, some of them presenting a minute point of ulceration at the apex. The mucous membrane of the cæcum is thickened and sprinkled with points of pseudomembrane; it also presents a few small follicular ulcers. No. 396 is a portion of the cæcum with the vermiform appendix; there are a number of small follicular ulcers in the mucous membrane of the appendix, and of the cæcum near its orifice. No. 397 is a portion of the sigmoid flexure and rectum of the same patient, with numerous punched-out extremely small ulcers, between which the mucous surface is frosted with pseudomembrane.]

CASE 432.—Private Richard Bagler, company H, 6th Ohio cavalry; age 47; admitted from the hospital of the Cavalry Corps, City Point, Virginia, November 14, 1864. Chronic diarrhœa. The patient was in an advanced stage of the disease. He was treated with astringents and stimulants, astringent enemata, &c. The discharges soon became involuntary, and he died November 18th. *Autopsy* next day, by Acting Assistant Surgeon Isaac M. Downs: Numerous follicular ulcers with dark colored bases were found throughout the colon; between them the mucous membrane was slightly frosted with pseudomembrane; the walls of the colon were thickened. [The condition of other organs is not recorded.]—Surgeon N. R. Moseley, U. S. V. [No. 438, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the transverse colon, presenting numerous large follicular ulcers, and somewhat frosted with pseudomembrane.]

CASE 433.—Private John Fulton, company B, 16th Pennsylvania cavalry; age 23; admitted from the hospital of the Cavalry Corps, City Point, Virginia, November 14, 1864. Intermittent fever and chronic diarrhœa. Treatment: November 15th: Quinine and a febrifuge mixture. November 30th: Quinine and opium. December 15th: Continue treatment; add stimulants and astringent enemata. The diet throughout consisted of milk and farinaceous food. Died, December 27th. *Autopsy* by Acting Assistant Surgeon L. M. Osmun: The whole large intestine was thickened, and presented numerous follicular ulcers, and quite a number of cysts about the size of peas; the mucous membrane between the ulcers was congested, and had shreds of pseudomembrane adherent to it. [The condition of the other organs is not recorded.]—Surgeon N. R. Moseley, U. S. V. [No. 527, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the thickened transverse colon, which presents a number of follicular ulcers, between which there is some adherent pseudomembrane. When first received at the museum a number of small cysts projected above the surface of the gut; in the alcohol these have collapsed, and the excavations thus made resemble the other ulcers.]

The notes of the next case were forwarded, with the specimens, from COLUMBIAN COLLEGE HOSPITAL, Washington, D. C., Surgeon Thomas R. Crosby, U. S. V., in charge:

CASE 434.—Private Jacob Hilgert, company E, 104th Pennsylvania volunteers; admitted from Stone hospital January 10, 1865. Diarrhœa and consumption. [This man is borne on the register of Stone hospital, Washington, D. C., admitted December 9, 1864—chronic bronchitis—sent to Columbian hospital January 10th.] He had a distressing diarrhœa, together with a severe cough, and expectorated large quantities of muco-purulent sputa streaked with blood. There was dulness on percussion over the upper third of the right lung, and tubular respiration was heard on both sides. Treatment: Cod-liver oil with six ounces of whiskey daily. Diet: Milk, beefsteak and toast. The cod-liver oil appeared to increase his diarrhœa, and, January 16th, fusel-oil in five-drop doses was substituted, to be taken in his whiskey. January 25th: The expectoration is more copious, and his strength is failing; appetite very poor; he has four or five stools daily. He died February 6th.—Acting Assistant Surgeon H. D. Vosburgh. *Autopsy* fourteen hours after death: Both lungs contained numerous minute tubercles; near the apex of the right lung there was a cavity about the size of an orange, and on the surface of the upper lobe of the left lung a large and much puckered cicatrix-like depression was observed; there were pleuritic adhesions on the right side. Both small and large intestines presented tubercular ulcers. The mesenteric glands were enlarged. [Nos. 480 to 487, Medical Section, Army Medical Museum, are from this case. No. 480 is the upper lobe of the right lung, the cut surface of which shows a large number of minute tubercles. At the top of the lobe there is a cavity the size of an orange, with distinct firm walls. No. 481 is the upper lobe of the left lung, presenting on its convex surface a large and much puckered cicatrix-like depression. No. 482 is a portion

of the upper part of the jejunum, presenting three small tubercular ulcers. No. 483 is from the upper part of the ileum of the same patient, and presents a large oval tubercular ulcer the long diameter of which is transverse to the gut. No. 484 is from the lower part of the ileum of the same patient, and presents a Peyer's patch which is the seat of three small tubercular ulcers. No. 485 is the lower extremity of the ileum, with the ileo-cæcal valve and part of the cæcum; there is a transverse ulcer just above the valve, and the cæcum is thickened and ulcerated. No. 486 is the vermiform appendix, which is deeply ulcerated. No. 487 is a portion of the transverse colon, which is thickened, and presents a number of deep ulcers.]

The next case is from the case-book of STANTON HOSPITAL, Washington, D. C., Surgeon Benjamin B. Wilson, U. S. V., in charge:

CASE 435.—Private Flavius J. Garrigus, company K, 140th Indiana volunteers; age 24; admitted from the 23d Army Corps February 3, 1865. Chronic diarrhœa. The patient was very much emaciated. He has had diarrhœa for about two months, the number of passages varying from five to fifteen in the twenty-four hours. The stools are mucoid and watery, but contain no blood; at times the abdominal pain is very great. The treatment consisted chiefly in the use of opium combined with astringents, such as sulphate of copper, acetate of lead, tannin, &c. Stimulants were also used freely. Died, February 19th. *Autopsy* four hours after death: The heart and lungs were normal. The mucous membrane of the lower part of the small intestine was very much thickened, softened and congested, but Peyer's patches were healthy, and there was no ulceration. Portions of the mucous membrane of the colon were also inflamed, but not thickened nor ulcerated.—Acting Assistant Surgeon D. Webster Prentiss.

The notes of the next case were forwarded, with the specimen, from the REGIMENTAL HOSPITAL of the 8th Illinois cavalry, Washington, D. C., by Surgeon Abner Hard:

CASE 436.—Private Frederick Gewecke, company K, 8th Illinois cavalry; German; age 27; admitted to regimental hospital May 6, 1864. He had been under treatment in quarters for some time with diarrhœa alternating with constipation. His breath was very offensive, resembling emanations from putrid animal matter. Obstinate diarrhœa soon supervened, with fever of an adynamic type. This state continued, with anorexia and emaciation, until May 18th, when he had hæmorrhage of the bowels. The turpentine he was taking was then increased in quantity, and the hæmorrhage was checked by enemata of solution of the persulphate of iron and laudanum. It recurred, however, several times, and he died May 23d. *Autopsy:* The lungs, liver, spleen and kidneys were apparently healthy. The mucous membrane of the small intestine was softened and ulcerated in patches. The colon from the cæcum to the rectum was ragged with ulceration; there were more than twenty perforations, yet no fæcal matter had escaped into the peritoneal cavity, and there were few adhesions showing peritoneal inflammation.—[No. 322, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the thickened ascending colon, presenting a number of deep ulcers with ragged edges. Two of the ulcers have perforated.]

The next five cases were forwarded on medical descriptive lists from the FIRST DIVISION of the ALEXANDRIA HOSPITAL, Virginia, Surgeon Charles Page, U. S. A., in charge from the date of the first case until August 23, 1864; afterward Surgeon Edwin Bentley, U. S. V.:

CASE 437.—Private Israel Bush, company I, 46th Pennsylvania volunteers; age 33; admitted September 16, 1863. Dysentery. The patient has frequent bloody discharges from the bowels; pulse 100; tongue coated. He is very much reduced in flesh and strength; no appetite. To take every three hours a powder containing one-eighth of a grain of calomel, three grains of Dover's powder, two grains of tannic acid, and four grains of prepared chalk. September 18th: The discharges from the bowels are restrained; the patient is feeling more comfortable, but is very weak and has no appetite. September 20th: The bowels are moved from five to six times a day; pulse 100 per minute; tongue covered with a white fur. R. Nitrate of silver four grains, opium eight grains; make sixteen pills. Take one every four hours. Milk-punch. The dysenteric discharges, however, continued unchecked, and the patient gradually sank. Died, September 25th. *Autopsy* twelve hours after death: There was extensive peritoneal inflammation; the mucous membrane of the ileum and ascending colon was also inflamed, and the latter was extensively ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon John Flickinger.

CASE 438.—Private Alfred Taylor, company B, 121st Pennsylvania volunteers; admitted from the hospital of the 3d Division, 1st Corps, near Catlett's Station, Virginia, November 4, 1863. Diarrhœa. The patient was very much broken down, and said he had suffered from diarrhœa for some time. R. Dover's powder ten grains, nitrate of potassa four grains, calomel one grain; three times daily. Milk diet. November 6th: He had a chill followed by fever, cough, and uneasiness in the chest. R. Dover's powder twenty-five grains, sulphate of quinia fourteen grains, mercury with chalk twelve grains; make five powders. Take one every three hours. A mustard plaster to the chest. Flaxseed-tea and nitre to drink. November 7th: Cough frequent; expectoration scanty; skin dry; some pain in the right side of the chest. On auscultation over the seat of pain some crepitation was discovered. To take, three times daily, a powder containing six grains of Dover's powder, two of quinine, and three of powdered camphor; also two ounces of wine every four hours. November 8th, morning visit: Pulse 97; skin dry; expectoration scanty. Continue treatment. Apply a blister six inches by seven to the right side of the chest. He died during the afternoon. *Autopsy:* The lower part of the right lung was hepatized. The heart and left lung were normal. No disease was detected in the stomach or bowels. The liver and spleen appeared to be healthy.—Acting Assistant Surgeon James Robertson.

CASE 439.—Private Lewis Iagle, company D, 8th Maryland volunteers; age 50; admitted from the hospital of the 3d Division, 1st Corps, November 4, 1863. Dysentery. This patient was very feeble, and had but little stamina to resist disease. He continued to sink from the time of admission. The treatment consisted in the use of pills of opium, camphor, and blue mass, with milk-punch and other stimulants. After November 9th, turpentine emulsion was administered. Died, November 13th.

*Autopsy:* The heart and lungs were normal. The liver was healthy. Two large gall-stones were found in the gall-bladder. There was extensive inflammation of the colon.—Acting Assistant Surgeon James Robertson.

CASE 440.—Private Amos Stork, company A, U. S. Engineers; admitted from the army of the Potomac January 10, 1864. Diarrhœa. The patient was extremely emaciated, had no appetite, and was in a typhoid condition; his stools were small and fetid. There was no vomiting, and he did not complain. He died January 16th, at 6 P. M. *Autopsy:* The thoracic viscera were healthy, except that the heart was small. The stomach was normal. The mucous membrane of both the small and large intestine was ulcerated; in the jejunum there was an invagination about three inches long, and another rather larger in the ileum. The mesenteric glands were diseased. The spleen was enlarged. The liver and kidneys were normal; the gall-bladder was empty.—Acting Assistant Surgeon W. Leon Hammond. [No. 44, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the jejunum, which presents a well-marked invagination, but no evidences of peritoneal inflammation.]

CASE 441.—Private Emmanuel Straw, company I, 58th Pennsylvania volunteers; admitted from Washington street prison September 26, 1864. Chronic diarrhœa. This case was complicated with hemorrhoids. There was great irritability of the stomach from the time of admission. Died comatose, October 21st. *Autopsy* eight hours after death: Both lungs presented patches of black pigment superficially, but were otherwise healthy; old pleuritic adhesions connected the lower lobe of the right lung to the thoracic parietes. The liver was unusually large, and presented the nutmeg appearance. The small intestine was inflamed throughout; the colon extensively ulcerated. Kidneys fatty.

Of the next twenty-two cases the first three were from medical descriptive lists, the remainder from the case-book of the SECOND DIVISION of the ALEXANDRIA HOSPITAL, Virginia, Surgeon T. Rush Spencer, U. S. V., in charge from the date of the first case to September 27, 1864; afterward Surgeon Edwin Bentley, U. S. V. Nineteen of the autopsies were made and recorded in the case-book by Acting Assistant Surgeon Thomas Bowen:

CASE 442.—Private G. A. Wagner, company K, 150th New York volunteers; age 23; admitted September 17, 1863. Chronic diarrhœa. At the time of admission, besides diarrhœa, the patient had symptoms of pneumonia. He was much debilitated. To take, morning and evening, four grains of Dover's powder, half a drachm of subnitrate of bismuth, and five grains of calomel in one powder; milk diet. September 18th: The cough is slightly better, and the passages are less frequent. Treatment and diet continued. September 19th: The stools are less frequent, but are still watery; the cough continues. To take a teaspoonful of syrup of squill three times a day besides the powders. September 29th: Condition improving; stools still watery, but not frequent. To take twenty drops of the syrup of the iodide of iron three times a day; also tincture of cinchona. October 5th: Is again attacked with violent diarrhœa, having eight passages in the twenty-four hours. Renew the subnitrate of bismuth in half-drachm doses; milk diet. October 7th: Patient very low; passages ten per day. Continue the subnitrate of bismuth; also give enemata of tannic acid and opium. October 8th: The passages have decreased in number to five in the twenty-four hours, but are mixed with blood. Stop the bismuth. Take three grains of powdered opium twice a day; milk-punch. October 9th: Patient complains of severe pain in right iliac region; had five bloody passages in the last twenty-four hours. To take powders of tannic acid, calomel, and opium every three hours; a mustard plaster to the abdomen; milk-punch. October 10th: The patient lies in a state of stupor, pulse feeble and trembling. Died at 9 A. M. *Autopsy:* There was extensive inflammation of the ileum, cæcum, and colon.—Acting Assistant Surgeon Thomas H. Stillwell.

CASE 443.—Private Johnson Houghtailing, company E, 19th New York cavalry; age 22; admitted October 13, 1863. Chronic diarrhœa. This man had suffered with diarrhœa since the middle of May last. In June he had typhoid fever. He is now much emaciated and weakened, cannot raise his head from the pillow; tongue coated with a thin brown coat, which is broken off in spots, showing a red dry surface beneath; has fifteen to twenty stools a day, with considerable tormina; there is a good deal of tenderness along the line of the colon; pulse 60 and full; no appetite. To take a pill containing a grain of opium and two grains of tannic acid every four hours; four ounces of cherry-brandy daily. October 15th: Had only seven passages in the last twenty-four hours; appears to be improving; can raise up in bed. To take a drachm of subnitrate of bismuth during the day, in three doses; milk diet; cherry-brandy as before. October 16th: Has a voracious appetite, which needs to be carefully regulated. Continue treatment. Substitute for the brandy two ounces of egg-nog every four hours. October 19th: Has had no movement of the bowels during the last twenty-four hours; pulse 64, full; appetite good; strength increasing rapidly. To take thirty drops of the tincture of the chloride of iron every five hours. October 20th: Bowels have not moved yet. Complains of a sense of fulness in the head and dizziness. Prescribed a laxative. October 21st: The medicine has operated on the bowels. The patient says he feels uncommonly well; appetite very good. To take quinine and whiskey as a tonic, with tincture of the chloride of iron; egg-nog; extra diet. October 22d: Sat up some time yesterday; bowels moved once. Continue treatment. October 23d: Said he felt quite well; had but two natural looking movements of the bowels in the last twenty-four hours; was able, with a little help, to get up to use the vessel. About 9.30 A. M. his breathing suddenly became very short and rapid, and he died in a few moments, without a struggle or effort to speak. *Autopsy* eight hours after death: The brain, lungs and heart appeared to be quite natural, except that perhaps the blood-vessels of the brain were a little fuller of blood than usual. The liver was rather large and excessively congested; otherwise its appearance was healthy. The spleen was also large and in a highly congested state. The stomach was healthy. There was extensive ulceration of the intestines, both large and small, and considerable thickening of the mucous membrane of the colon. The kidneys were healthy. Nothing was found to account for the sudden death of the patient.—Acting Assistant Surgeon A. Walter Tryon.

CASE 444.—Private Edward B. Chessman, company H, 32d Massachusetts volunteers; age 34; admitted December 5, 1863. Chronic diarrhœa. The patient had been sick nine weeks, having on an average eight passages per day; his appetite was

poor; he was very weak and greatly emaciated. Treatment: Tannic acid and opium, tincture of the chloride of iron, whiskey. December 9th: The diarrhœa is decreasing; he has now about four passages per day. Treatment continued. December 11th: Diarrhœa nearly controlled. December 15th: Diarrhœa has again returned; passages eight per day and painful. Complains of constant abdominal pain. Apply a mustard poultice; acetate of lead and opium. December 19th: The diarrhœa continues unchecked. The patient is losing strength. Died, December 27th. *Autopsy:* The lungs were congested, but contained no tubercles. The mucous membrane of both small and large intestine was inflamed and thickened.—Acting Assistant Surgeon Thomas H. Stillwell.

CASE 445.—Private Adelbert Caywood, company A, 24th New York cavalry; age 18; admitted from City Point, Virginia, October 2, 1864. Chronic diarrhœa. Died, October 25th. *Autopsy* twenty-four hours after death: Rigor mortis great; body very much emaciated. Head, neck and spinal column not examined. The pericardium contained half an ounce of clear serum. The heart was rather smaller than usual, its structure normal, although a little pale; all the valves closed perfectly, but they were somewhat attenuated; both auricles and ventricles contained small firm clots. The right pleural cavity contained an ounce of bloody serum; there were no adhesions between the pulmonary and costal pleura on either side, but the lobes of the right lung were interadherent. The left lung was pale, its structure normal; the right lung was congested, and portions of its upper and lower lobes, anteriorly, were in the stage of gray hepatization. The bronchi contained some muco-purulent matter, but their mucous membrane was normal; the bronchial glands were healthy with the exception of one, which contained a deposit of calcareous matter. The mucous membrane of the stomach was slightly congested. The duodenum was normal. The small intestine was congested in regious through its whole tract, but not ulcerated. The large intestine was contracted, thickened, and congested from the cæcum to the rectum, but there were no ulcers present. The liver was of medium size, its structure normal; the gall-bladder contained an ounce of very dark bile. The pancreas and spleen were normal. The kidneys apparently healthy in structure, but pale; the bladder contained about eight ounces of urine.—Acting Assistant Surgeon Thomas Bowen.

CASE 446.—Private James K. Foltz, company B, 60th Ohio volunteers; age 17; admitted from the field October 12, 1864. Chronic diarrhœa. [This man appears on the register of the depot hospital of the 9th Corps, City Point, Virginia, admitted September 1st—rheumatism and diarrhœa; no disposition.] Died, October 27th. *Autopsy* forty-eight hours after death: Rigor mortis great; body extremely emaciated; bed-sores posteriorly. Head, neck and spinal column not examined. The left pleural cavity contained an ounce of fluid, and there was a recent deposit of lymph on the left lung posteriorly; a small deposit of tubercle was observed in the lower lobe of the left lung; the lower lobe of the right lung was in the last stage of pneumonia; its structure broke down easily when crushed between the fingers; it was adherent to the costal pleura. The heart and pericardium were normal. The liver was normal; the gall-bladder contained about two drachms of bile. The spleen and pancreas were normal. The mucous membrane of the stomach and jejunum was quite healthy; that of the lower part of the ileum, colon, and rectum very much inflamed, but not ulcerated, nor were there any ulcerations in Peyer's patches. The mesenteric glands were very dark colored. The kidneys were normal; the bladder empty.—Acting Assistant Surgeon Thomas Bowen.

CASE 447.—Private George Stewart, company F, 4th New York artillery; age 45; admitted from the field October 21, 1864. Chronic diarrhœa. [This man appears upon the register of the depot hospital of the 2d Corps, City Point, Virginia, admitted October 6th—chronic diarrhœa—sent to general hospital October 20th.] Died, November 1st. *Autopsy* fifty-two hours after death: Rigor mortis very slight; body emaciated; slight suggillation posteriorly. Head, neck and spinal column not examined. The left pleural cavity contained about an ounce of fluid. The left lung was normal; the apex of the right lung was adherent posteriorly to the costal pleura; the lobes of the lung interadherent; the lower lobe hepatized posteriorly. The pericardium contained two drachms of fluid. The heart was normal. The spleen, pancreas and liver were normal; the gall-bladder contained about an ounce of bile. The left suprarenal capsule was enlarged and softened. The left kidney, dark externally, congested internally, had six small abscesses in its cortical substance. The right suprarenal capsule was softened. The right kidney was similar to the left, except that it had only two small abscesses in its substance; its pelvis was congested, and the corresponding ureter filled with a purulent fluid. The bladder was full of urine; its mucous coat seemed thickened. The mucous membrane of the stomach was dark colored; that of the small intestine congested in patches; that of the colon inflamed and very dark colored; that of the rectum very much thickened and extensively ulcerated.—Acting Assistant Surgeon Thomas Bowen.

CASE 448.—Private Monroe Ungers, company B, 50th Pennsylvania volunteers; age 18; admitted from the field August 10, 1864. Chronic diarrhœa. [This man is borne on the register of the depot hospital of the 9th Corps, City Point, Virginia, admitted August 3d—remittent fever; no disposition.] Died, November 1st. *Autopsy* thirteen hours after death: Rigor mortis great; body extremely emaciated; slight suggillation posteriorly. Head, neck and spinal column not examined. There were extensive old adhesions posteriorly between the lower lobe of the left lung and the costal pleura; the right pleural cavity contained an ounce of serous fluid; the left lung was healthy; the right healthy anteriorly, but posteriorly presented the appearances of gray hepatization; on the posterior surface of the lower lobe was a deposit of recent lymph about an inch in diameter. The pericardium contained two ounces of serum. The heart was very small, weighing about four ounces; its structure was healthy although pale. The cavities of both sides contained small, firm, white clots. The stomach was normal. The small intestine was congested throughout its whole extent, and very much inflamed near the ileo-cæcal valve; the large intestine inflamed and ulcerated in spots. The liver was congested; the gall-bladder contained an ounce and a half of yellow bile. The pancreas was normal. The kidneys were of a darker color than usual; the bladder contained about an ounce of urine.—Acting Assistant Surgeon Thomas Bowen.

CASE 449.—Private Frederick Rockstadt, company G, 204th Pennsylvania volunteers; age 45; admitted from regimental hospital October 28, 1864. Chronic diarrhœa. Died, November 1st. *Autopsy* twenty-four hours after death: Rigor mortis great; body emaciated; slight suggillation posteriorly. Head, neck, and spinal column not examined. The pericardium contained about two drachms of fluid. The heart was normal in size and structure, its valves healthy; the right auricle contained

a large firm clot; smaller clots of the same character were found in each of the other cavities; the large arteries and veins contained a small quantity of dark blood. There were extensive old pleuritic adhesions on both sides. The left lung was very much congested, and scarcely crepitated when squeezed; the right lung was in the stage of gray hepatization. The bronchial glands were normal. The great omentum was contracted, thickened, and adherent to the small intestine. The parietal surface of the peritoneum was covered with a deposit of lymph; the peritoneal cavity contained three ounces of fluid. The stomach was filled with a yellow fluid which had a fæcal odor. The peritoneum covering the small intestine was inflamed, and the knuckles of intestine were adherent to each other and to the parietal peritoneum by recent deposits of lymph. The mucous membrane of the small intestine was healthy; the colon inflamed and ulcerated; one of the ulcers near the sigmoid flexure had perforated; the rectum was perfectly disorganized, soft, thickened and dark colored. The liver was softer and darker than usual, and filled with small abscesses; about twenty of these were counted, varying in size from a pea to a walnut; the gall-bladder contained about two ounces of bile. The pancreas was normal. The spleen softened. The kidneys and ureters normal; the bladder filled with urine.—Acting Assistant Surgeon Thomas Bowen.

CASE 450.—Private William C. Sweeney, company A, 73d New York volunteers; age 39; admitted from the depot hospital of the 2d Corps, City Point, Virginia, November 2, 1864. Chronic diarrhœa. Died, November 3d. *Autopsy* twenty hours after death: Rigor mortis moderate; body very much emaciated; slight suggillation posteriorly. Head, neck and spinal column not examined. There were firm and extensive old pleuritic adhesions on both sides. The posterior portion of the lower lobe of the left lung was in the stage of red hepatization; in the apex of the right lung was a deposit of tubercle. The bronchial glands were enlarged and somewhat softened. The pericardium contained two ounces of fluid. The heart was normal. The omentum was congested. The liver was normal; the gall-bladder contained an ounce and a half of bile. The spleen was very small, but otherwise normal. The pancreas normal. The mucous membrane of the small intestine was very much congested, while that of the colon and rectum was inflamed, thickened, and ulcerated through its whole extent. The kidneys and bladder were normal.—Acting Assistant Surgeon Thomas Bowen.

CASE 451.—Private John F. McGauhey, company M, 21st Pennsylvania cavalry; age 18; admitted from the field October 12, 1864. Chronic diarrhœa. Died, November 8th. *Autopsy* thirty-eight hours after death: Rigor mortis very slight; body very much emaciated; slight suggillation posteriorly and on the abdomen. Head, neck and spinal column not examined. The left pleural cavity contained two, the right three, ounces of bloody serum. There were old pleuritic adhesions on the right side. There were deposits of tubercle in the upper lobes of both lungs; the lower lobes were in the stage of gray hepatization. The pericardium contained two drachms of serum. The heart was normal. The great omentum was very much congested. The liver was normal; the gall-bladder contained about three drachms of bile. The spleen and pancreas were normal. The kidneys were normal in size, but their cortical substance was very pale and had a fatty appearance. The stomach and duodenum were normal. Both the small and the large intestine were very red externally. The mucous membrane of the jejunum and ileum was congested, inflamed in patches, and there were several ulcers in the lower part of the ileum, which were not situated in Peyer's patches. The mucous membrane of the colon and rectum was thickened and inflamed.—Acting Assistant Surgeon Thomas Bowen.

CASE 452.—Private Oliver Bradley, company I, 179th New York volunteers; age 39; admitted from the field October 21, 1864. Chronic diarrhœa. [This man appears on the register of the hospital of the 2d Division, 9th Corps, admitted October 12th—typhoid fever—sent to depot hospital October 18th. He is borne on the register of the depot hospital of the 9th Corps, City Point, Virginia, admitted October 18th—chronic diarrhœa—sent to general hospital October 20th.] Died, November 11th, of typhoid fever. *Autopsy* fourteen hours after death: Rigor mortis moderate; body much emaciated; suggillation posteriorly. The dura mater was normal; there was half an ounce of serum in the subarachnoid space. The brain and pia mater were normal. Neck and spinal column not examined. The pericardium contained an ounce of clear fluid. The heart and its valves were normal; small fibrinous clots were found in both auricles and ventricles. There were slight adhesions between the base of the left lung and the diaphragm; the upper lobe of the left lung was normal, its lower lobe congested posteriorly; the right lung was normal. Three of the bronchial glands were very large, and contained an abundant deposit of calcareous matter. The liver was enlarged, but its structure seemed normal; the gall-bladder contained an ounce and a half of bile. The spleen, pancreas, mesenteric glands, kidneys, stomach, duodenum, and jejunum were normal. The mucous coat of the ileum presented several patches of inflammation. There were two ulcers in the upper part of the colon, which was otherwise normal. The rectum was inflamed.—Acting Assistant Surgeon Thomas Bowen.

CASE 453.—Private Henry Brady, company and regiment not recorded; admitted from Sanitary lodge November 12, 1864. Chronic diarrhœa. Died, November 13th. *Autopsy* fourteen hours after death: Great rigor mortis; body emaciated; an old cicatrix in the right iliac region. The subarachnoid space contained half an ounce of clear serum; the brain was normal. Neck and spinal column not examined. There were old pleuritic adhesions on both sides. The left pleural sac contained two ounces of serum. The posterior part of the lower lobe of the left lung was in the first stage of pneumonia, a small portion of it hepatized; the right lung was normal anteriorly, congested posteriorly. The pericardium contained half an ounce of serum. The heart was normal. The spleen was twice the usual size, but apparently normal in structure. The pancreas and liver normal; the gall-bladder contained an ounce of bile. The kidneys were normal; the bladder contained a pint and a half of urine. The mesenteric glands were a little darker than usual. The stomach and small intestine were normal. The descending colon and rectum were contracted, their mucous coat very much thickened and extensively ulcerated.—Acting Assistant Surgeon Thomas Bowen.

CASE 454.—Private Jeremiah Grinder, company H, 6th Pennsylvania heavy artillery; age 22; admitted from the field November 14, 1864. Cholera morbus. Died, November 15th. *Autopsy* twenty-eight hours after death: Rigor mortis very great; body muscular, well developed; no emaciation; extensive suggillation posteriorly. Head, neck and spinal column not examined. There were slight pleuritic adhesions posteriorly on both sides. Both lungs were engorged with blood, and did not

collapse when the sternum was removed. The heart was normal; there were large, very firm yellow clots in both auricles, and small ones in both ventricles; the auricular clot on the left side extended about six inches into the branches of the left pulmonary veins; these veins emptied into the heart by a single opening. The omentum was congested. The liver was large, but otherwise healthy; the gall-bladder contained about an ounce of dark bile. The spleen was normal. The pancreas a little congested, but otherwise healthy. Both kidneys were congested. The mesenteric glands were somewhat congested and enlarged. The mucous membrane of the ileum, for twelve inches from the ileo-cæcal valve, was thickened, inflamed, and ulcerated; it was very dark colored, and appeared almost gangrenous in many places. The mucous membrane of the colon and rectum was inflamed and ulcerated; the ulcers had ragged edges, and were arranged in narrow bands around the circumference of the gut; in other parts of the mucous membrane there were whitish deposits of pseudomembranous lymph.—Acting Assistant Surgeon Thomas Bowen.

CASE 455.—Private Thomas W. Martin, company I, 67th Pennsylvania volunteers; age 23; admitted from the field August 10, 1864. Chronic diarrhœa. [This man appears on the register of the regimental hospital of the 67th Pennsylvania volunteers, admitted April 7, 1864—catarrh—sent to general hospital April 20th. He is borne on the register of the Lincoln hospital, Washington, D. C., admitted April 21st—chronic diarrhœa—sent to Philadelphia May 3d. The register of the Mower hospital, Philadelphia, Pennsylvania, reports him admitted May 4th—chronic diarrhœa—returned to duty June 24th. He next appears on the register of the depot hospital of the 6th Corps, City Point, Virginia, admitted July 6th—chronic diarrhœa—sent to general hospital August 9th.] Died, November 16th. *Autopsy* twenty-four hours after death: Rigor mortis very great; body very much emaciated; slight suggillation posteriorly. Head, neck, and spinal column not examined. There were firm, old pleuritic adhesions on both sides. Both lungs contained extensive deposits of tubercle, which were found in all parts, but most abundantly in the upper lobes, in which there were also two or three cavities the size of small nutmegs. An extensive deposit of miliary tubercles was observed on the surface of the left costal pleura. The bronchial glands were very much enlarged. The pericardium contained about two drachms of serum. The heart and its valves were normal; both auricles were filled with black blood. The great omentum was thickened, contained deposits supposed to be tubercular, and was adherent to the small intestine and parietal peritoneum. Deposits of black pigment were observed on the parietal peritoneum and on the outer surface of the intestines; in the latter case they were associated with a deposit of small tubercles; the knuckles of small intestine were interadherent. The anterior portion of the liver was coated with recent lymph; the organ was normal in size but pale, and under the microscope appeared to be fatty; the gall-bladder was nearly empty. The spleen and pancreas were normal. Both kidneys were slightly congested. The mesenteric glands were enlarged and tuberculous. The mucous membrane of the stomach and duodenum was healthy. Large ulcers were scattered through the whole extent of the jejunum, ileum, and colon; they were most abundant in the lower part of the ileum, were of oval form, and had thickened, ragged, indurated edges; some of them were apparently healing, and the mucous coat around these was puckered up in small folds radiating from the ulcers.—Acting Assistant Surgeon Thomas Bowen.

CASE 456.—Private Isaac Koonts, company K, 204th Pennsylvania volunteers; age 41; admitted from regimental hospital October 28, 1864. Remittent fever. Died, November 17th, of chronic diarrhœa. *Autopsy* forty-one hours after death: Rigor mortis moderate; body not much emaciated; suggillation posteriorly. Head, neck and spinal column not examined. There were no pleuritic adhesions on either side. The right lung and the upper lobe of the left were normal; the lower lobe of the left lung was in the last stage of pneumonia. The pericardium contained two drachms of fluid. The heart was normal. There were but nine attached and three floating ribs, one of the latter being about two inches long. The great omentum was very fat. The intestines were filled with gas. The liver was a little enlarged, and paler than usual. The spleen and pancreas were normal. The mesenteric glands were dark colored, and a little enlarged. The mucous membrane of the stomach, duodenum, and jejunum was normal. Peyer's patches were very dark in the upper part of the ileum, but not thickened or ulcerated; in the lower part they were slightly thickened, ulcerated, and apparently undergoing the healing process. The colon was much thickened, blackened, and ulcerated. The rectum was still more extensively ulcerated. The kidneys were normal; the bladder contained half a pint of urine.—Acting Assistant Surgeon Thomas Bowen.

CASE 457.—Private Azro A. Shippy, company E, 2d United States sharpshooters; age 41; admitted from the depot hospital of the 2d Corps, City Point, Virginia, November 2, 1864. Chronic diarrhœa. Died, November 20th, of pneumonia. *Autopsy* ten hours after death: Rigor mortis very great; body very much emaciated. Head, neck, and spinal column not examined. There were extensive pleuritic adhesions on the right side. A few small tubercles, not softened, were observed in the apex of the right lung; the lower lobe was generally in the first stage of pneumonia, but small portions of it were hepatized; there were old pleuritic adhesions on the left side posteriorly; the upper lobe of the left lung was normal, the lower lobe in the same condition as the lower lobe of the right lung. The pericardium contained about two drachms of serum. The heart was normal. The liver was normal; the gall-bladder contained about half an ounce of bile. The spleen was slightly enlarged. The pancreas and mesenteric glands normal. The cortical substance of the kidneys was pale. The mucous membrane of the stomach was congested; that of the jejunum normal; that of the lower part of the ileum thickened and very much inflamed. The mucous membrane of the colon and rectum was thickened, inflamed, and ulcerated in several places. Acting Assistant Surgeon Thomas Bowen.

CASE 458.—Private George W. Doremire, company M, 2d Pennsylvania cavalry; age 19; admitted from Soldiers' Rest October 5, 1864. Chronic diarrhœa. [This man appears on the hospital register of the Soldiers' Rest, Alexandria, Virginia, admitted June 28th—chronic diarrhœa; no disposition.] Died, November 25th. *Autopsy* fourteen hours after death: Rigor mortis great; body very much emaciated; sordes on teeth. Head, neck and spinal column not examined. The pericardium contained about a drachm of serum. The heart was small, but normal in position and structure, except that the foramen ovale was not perfectly closed; the opening was very oblique, and its edges overlapped so that there could be no admixture of blood in the auricles. There were small dark clots in both auricles and ventricles. There were old pleuritic adhesions on the left side

posteriorly, and at the apex of the lung. The lower lobe of the left lung generally was in the first stage of pneumonia; a small portion of it was hepatized; the lobes of the right lung were adherent to each other; the lower lobe was in the same condition as the corresponding lobe of the left lung, except that its inferior margins were coated with recent lymph. The mucous membrane of the stomach, duodenum, and jejunum was normal; that of the lower part of the ileum was congested in patches, while in the cæcum, colon, and rectum the mucous membrane was much inflamed. There were five ulcers, the size of grains of barley, in the rectum. The liver, pancreas, and kidneys were normal. The spleen was indurated, and weighed but about two ounces. Acting Assistant Surgeon Thomas Bowen.

CASE 459.—Corporal John Magher, company E, 88th New York volunteers; age 24; admitted from the field October 21, 1864. Chronic diarrhœa. [This man appears on the register of the depot hospital of the 2d Corps, City Point, Virginia, admitted September 24th—chronic diarrhœa—sent to general hospital October 20th.] Died, November 29th. *Autopsy* nine hours after death: Rigor mortis moderate; body emaciated; axillary and cervical glands very much enlarged; old ulcers (apparently chancres) on the penis; extensive suggillation posteriorly. The subarachnoid space contained an ounce of serum; the pia mater was injected; the brain was normal; fluid blood escaped from the sinuses when they were opened, and coagulated as perfectly as blood drawn during life. Neck and spinal column not examined. There were extensive firm, old pleuritic adhesions on both sides, and about four ounces of serum in each pleural cavity. In the apex of each lung was a deposit of cretefied tubercles; the lower lobes of both lungs were dark, congested, indurated, and crepitated very little when pressed between the fingers, but floated on water, (apparently first stage of pneumonia.) The bronchial glands contained large deposits of calcareous matter. The pericardium contained an ounce of serum. The heart was normal. The mucous membrane of the small intestine was healthy; that of the colon and rectum thickened, softened, extensively ulcerated, and of very dark color, (almost gangrenous.) The liver was normal in size, but when examined under the microscope was found to be in a state of fatty degeneration. The cortical portion of both kidneys was very pale, and when examined microscopically was found to be fatty. The spleen was very small; weight about three ounces. The pancreas was normal; immediately adjoining it were several enlarged lymphatic glands, which were partially cretefied. Many of the mesenteric glands were in the same condition.—Acting Assistant Surgeon Thomas Bowen.

CASE 460.—Private Emmanuel Fox, company H, 48th Pennsylvania volunteers; age 20; admitted from City Point, Virginia, November 2, 1864. Chronic diarrhœa. [This man appears on the register of the depot hospital of the 9th Corps, admitted October 26th—acute rheumatism; and on that of the hospital steamer Ben Deford, admitted November 1st; sent to general hospital November 2d.] He was very weak, and had frequent copious liquid evacuations, which were generally preceded by pain and followed by exhaustion; the skin was unusually cool, the pulse irregular. Treatment: Tonics, stimulants, and warm applications to the abdomen; milk and extra diet. The patient's appetite was generally pretty good, but there was a craving for improper food. For some time the glands of the neck were swollen, and there was a thin discharge from the ears. The eyes also seemed to be affected, and for several days before death he complained of pains in the arms. For the last week he could be induced to take but little food. Died, December 5th. *Autopsy* twenty-seven hours after death: Rigor mortis disappearing; body extremely emaciated; very slight suggillation posteriorly. The cranial sinuses were filled with blood; the subarachnoid space contained an ounce of serum; the vessels of the pia mater were injected; the substance of the brain was normal. Neck and spinal column not examined. There were no pleuritic adhesions. The left lung was normal; the right lung was normal anteriorly, posteriorly several of the lobules in all the lobes were hepatized, some of them having advanced to the stage of gray hepatization. There were small calcareous deposits in several of the bronchial glands. The heart was very small, but otherwise normal. The liver was normal; the gall-bladder contained about an ounce and a half of bile. The spleen and pancreas were normal, as was also the mucous membrane of the stomach, duodenum, and jejunum. The mucous membrane of the ileum presented several patches of dark dirty-red color, but no ulcers could be detected. The mucous membrane of the colon and cæcum was thickened and inflamed in patches; it peeled off easily, and there were one or two spots in which it was abraded. The mucous membrane of the rectum also was very much inflamed, softened, and thickened, peeling off easily, but not ulcerated. The kidneys were pale, but otherwise normal.—Acting Assistant Surgeon Thomas Bowen.

CASE 461.—Private Oliver S. Barnum, company B, 26th Michigan volunteers; age 30; admitted from the depot hospital of the 2d Corps, City Point, Virginia, October 21, 1864. Chronic diarrhœa. Died, December 13th. *Autopsy* twenty-six hours after death: Rigor mortis great; body emaciated; slight suggillation posteriorly. Head, neck and spinal column not examined. There were no pleuritic adhesions. The posterior portions of both lungs were hypostatically congested. The pericardium contained about an ounce of serum. The heart was normal, except that the foramen ovale was imperfectly closed, two small openings connecting the cavities of the auricles; these openings were protected by valve-like processes of the inter-auricular septum; the right auricle and the vena cava were filled with dark blood. The liver was full of blood, but otherwise normal; the gall-bladder contained about half an ounce of bile. The spleen was enlarged, but normal in color and consistence; the pancreas darkly congested. The mesenteric glands were very much enlarged and dark colored, especially those connected with the lower part of the ileum. The mucous membrane of the stomach, duodenum, and jejunum was normal. Many of Peyer's patches in the lower three feet of the ileum were thickened and ulcerated; the surfaces of the ulcers presented a worm-eaten appearance. Some of the solitary glands in the ileum near the ileo-cæcal valve, in the cæcum, and in the first six inches of the ascending colon, were ulcerated, and many others were enlarged but not ulcerated. The mucous membrane of the colon and rectum seemed a little softened, but was otherwise normal. The kidneys were very large, and their vessels were full of blood. The bladder was full of urine.—Acting Assistant Surgeon Thomas Bowen.

CASE 462.—Private William H. Carey, company F, 28th Michigan volunteers; admitted from regimental hospital January 26, 1865. Chronic diarrhœa. Died, February 2d. *Autopsy* eighteen hours after death: Rigor mortis very great; body not emaciated, a well-developed muscular subject; slight suggillation posteriorly. The dura mater and pia mater were congested; the whole surface of the brain was coated with recent lymph deposited in the pia mater; the brain-substance was normal; the

lateral ventricles contained two drachms of serum. Neck and spinal column not examined. There were no pleuritic adhesions; the pleural sacs contained an ounce of serum. The upper lobe of the left lung was normal, the lower lobe hepatized; the middle lobe of the right lung was hepatized, the lower lobe congested. The pericardium contained half an ounce of serum. The heart and its valves were normal. The omentum was injected and somewhat thickened. Nothing abnormal was observed in either small or large intestine. The liver was very much enlarged and pale; it presented a mottled appearance when cut into; the gall-bladder contained two ounces of bile. The spleen was very much enlarged and softened. The pancreas and mesenteric glands were normal. The left kidney was normal, the right apparently softened; in its medullary portion were two small abscesses about the size of small peas; the bladder contained about six ounces of urine.

CASE 463.—Private George Roberts, company H, 59th Massachusetts volunteers; age 46; admitted from the depot hospital of the 9th Corps, City Point, Virginia, October 22, 1864. Chronic diarrhœa. Died, February 7, 1865. *Autopsy* seventeen hours after death: Rigor mortis very great; body greatly emaciated; slight suggillation posteriorly. Head, neck, and spinal column not examined. Both pleuræ were coated with recently deposited lymph. There were old adhesions of the lower lobe of the left lung, slight adhesions of the upper lobe of the right; extensive deposits of tubercle in the upper lobes of both lungs, and two large cavities in the upper lobe of the right; the middle and lower lobes of this lung were congested; there was also a small cavity in the lower lobe of the left lung. The bronchial glands were enlarged, black and softened. The pericardium contained an ounce of serum. The heart was normal. The omentum was congested. The liver was pale and flabby, apparently in a state of fatty degeneration; the gall-bladder contained half an ounce of bile. The spleen was normal in size, but softened. The mesenteric glands were enlarged and filled with softened tubercle. The mucous membrane of the small intestine was thickened and rough. [?] There were several small ulcers in Peyer's glands. The colon was normal. The kidneys were pale and soft; on examination with the microscope they were found to be in a state of fatty degeneration; the bladder contained six ounces of urine.

## The next eighty-one cases are from the case-book of the THIRD DIVISION of the ALEXANDRIA HOSPITAL, Surgeon Edwin Bentley, U. S. V., in charge: *

CASE 464.—Corporal John Foster, company A, 49th New York volunteers; admitted September 10, 1862. Chronic diarrhœa. Died, October 25th. *Autopsy:* Body very much emaciated. The intestinal mucous membrane was extensively softened, particularly in the colon, where there was also some slight ulceration. The mesentery was highly congested.

CASE 465.—Private Archibald Toliver, company D, 20th Indiana volunteers; admitted October 14, 1862. Continued fever. Died, October 27th. *Autopsy* fifty hours after death: The mucous membrane of the stomach was softened, and presented numerous purple specks near the pyloric orifice. The spleen was enlarged and of light-blue color. The mucous membrane of the large intestine was soft and easily scraped off.

CASE 466.—Private John S. Nixon, company H, 59th New York volunteers; admitted October 29, 1862. Chronic diarrhœa. [The following entries with regard to this man appear on the register of the hospital of his regiment: December 25, 1861—diarrhœa; June 3, 1862—cold; June 17th—soreness in chest; June 25th—cough, and pain in the chest; June 27th—spitting blood; July 31st—night sweats; August 15th—sent to general hospital at Fortress Monroe.] The patient was admitted in a dying condition, having a loose stool every two hours. The discharges were dark, watery, bilious looking, and frequently involuntary. The pulse was scarcely perceptible at the wrist. Treatment: Stimulants, anodynes and astringents. Died, October 31st. *Autopsy* eight hours after death: Body extremely emaciated. The lungs were healthy. The pericardium contained four ounces of fluid. The gall-bladder was moderately filled with bile. The spleen was enlarged and softened. The intestines were distended with flatus, highly injected, and the mucous membrane softened. The bladder and kidneys were healthy.

CASE 467.—Private Aaron Case, company I, 5th Wisconsin volunteers; admitted October 24, 1862. Chronic diarrhœa, terminating in what was supposed to be typhoid fever. Died, November 1st. *Autopsy:* Body emaciated. The intestines were distended with flatus. The mucous membrane of the small intestine presented patches of softening and congestion, but no distinct ulceration could be found, nor was there any disease of Peyer's patches. The contents of the small intestine resembled pea-soup in color and consistence. Regions of injection were observed on the peritoneal surface of the small intestine, the mesentery and the greater omentum; the latter was connected to the abdominal parietes by adhesions which appeared to be recent. The liver was rather softer than normal. [No mention is made of the condition of the mucous membrane of the large intestine.]

CASE 468.—Private William H. Cole, company H, 11th Connecticut volunteers; age 23; admitted October 29, 1862. Chronic diarrhœa of two months' duration. The patient was extremely feeble and emaciated; he had daily from twelve to fifteen watery stools which were nearly natural in color, but occasionally streaked with blood. He had no cough, and a careful examination of the chest failed to detect anything abnormal. His abdomen was sunken, and somewhat tender on pressure; pulse frequent and feeble; tongue slightly coated with dry brown fur. A light but nutritious diet was ordered, and dry cups were applied to the abdomen, followed by warm poultices. Internally, alteratives, anodynes and astringents were tried, without benefit; subsequently turpentine emulsion and laudanum were administered, and a blister applied to the abdomen. Toward the close stimulants were freely given. Died, November 8th. *Autopsy:* The thoracic viscera were healthy. The mucous membrane of the small intestine was softened, and in three places ulcerated. The large intestine was much injected. The spleen slightly enlarged and quite firm. The liver and kidneys were normal.

* It is to be regretted that, in most instances, the records of this hospital do not show by whom the autopsies were made. It is known that many of them were made by Surgeon Bentley himself, or under his immediate supervision, but it is only possible to distinguish these from the others in a few cases.

CASE 469.—Private Peter Oleman, company A, 16th Michigan volunteers; admitted October 24, 1862. Chronic diarrhœa. Died, November 11th. *Autopsy:* Body extremely emaciated. There were slight pleuritic adhesions between the right lung and the thoracic parietes; firm adhesions to the diaphragm. The mucous membrane of the stomach was considerably injected and softened; that of the small intestine was also congested. In the large intestine the mucous membrane was congested, softened, and ulcerated, especially in the descending colon and rectum. There were tubercle-like deposits in the kidneys.

CASE 470.—Private James Ludlow, company F, 35th New York volunteers; admitted September 25, 1862. Chronic rheumatism and diarrhœa. He was extremely feeble, emaciated, and had large watery stools. Alteratives and astringents checked the diarrhœa for a time, but it recurred with increased violence; the tongue became dry; the pulse frequent and feeble. All treatment was obstinately resisted. Died, November 17th. *Autopsy:* Body extremely emaciated; abdomen sunken. The lungs were slightly congested. The heart normal. The mucous membrane of the ileum was softened, and in several places deeply ulcerated. The large intestine was not materially diseased. The liver and spleen were enlarged; the spleen was pulpy. The kidneys were normal.

CASE 471.—Corporal Louis Miller, company C, 7th New York volunteers; admitted October 24, 1862. Chronic diarrhœa. Died, November 20th. *Autopsy:* Body extremely emaciated. There was great discoloration, resembling ecchymosis, over the thorax and abdomen. The greater omentum and a large part of the mesentery were much injected. The mucous membrane of the jejunum and ileum was softened; in the ileum it was much injected. The mucous membrane of the colon was greatly injected and very much disorganized.

CASE 472.—Private Lewis Warner, company K, 118th Pennsylvania volunteers; admitted November 18, 1862. Dysentery. At the time of admission he had discharges from his bowels every three or four hours; the stools were very offensive, dark colored, grumous, and contained blood and pus; the pulse was small and rapid. Treatment: Acetate of lead and opium, stimulants. Died, November 20th. *Autopsy* eighteen hours after death: The bowels were distended with flatus. The external surface of the large intestine was of a dark lead-color; its mucous membrane highly congested, softened, and gangrenous in spots. The liver and spleen were healthy.

CASE 473.—Corporal John A. Schwartz, company G, 105th Pennsylvania volunteers; admitted October 14, 1862. Chronic diarrhœa. [This man appears on the regimental sick report as under treatment for diarrhœa May 29th, June 12th, and August 9th. [Died, November 20th. *Autopsy:* Body extremely emaciated. There was great discoloration, resembling ecchymosis, over the thorax and abdomen; excessive tympanites. The mucous membrane of the whole intestinal tract appeared to be inflamed and softened. The mesentery was much injected.

CASE 474.—Private Elias Havens, company E, 6th United States cavalry; admitted October 24, 1862. Chronic diarrhœa. Died, November 24th. *Autopsy:* The mucous membrane of the whole intestinal tract appeared to be inflamed; that of the stomach and small intestine was softened. The spleen was about twice its natural size.

CASE 475.—Private William Roland, company B, 1st Virginia cavalry; admitted November 2, 1862. Chronic diarrhœa of three months' duration. The patient was very feeble and much emaciated; skin dry; tongue red; abdomen flattened, and tender on pressure. Treatment: Alteratives, astringents and stimulants; warm fomentations to the abdomen. Died, November 28th. *Autopsy:* The omentum was congested; the mesenteric glands enlarged. The peritoneum of the small intestine was discolored, the mucous coat softened; there were several small ulcers near the ileo-cæcal valve. Liver and spleen slightly enlarged. The mesenteric glands were enlarged. [There is no record of the condition of the large intestine.]

CASE 476.—Private Joseph Tibbets, company B, 75th Ohio volunteers; admitted from regimental hospital, Chantilly, Virginia, November 18, 1862. Chronic diarrhœa of six weeks' duration. He was very feeble, much emaciated, and rapidly sank into a true typhoid condition, with dry tongue and delirium. Astringents, stimulants and concentrated food were given freely. Distressing nausea and vomiting supervened, utterly precluding for a time the administration of medicines by the mouth. A small blister applied over the epigastrium quieted the stomach somewhat, and the beef-essence and stimulants were resumed. Died, November 30th. *Autopsy:* The brain was normal. The lower lobes of the lungs slightly congested. The heart normal. The peritoneal coat of the lower portion of the small intestine was of a deep-red color; the mucous membrane of the ileum injected, softened, and in places entirely destroyed by ulceration. The mesenteric glands were greatly enlarged, and the greater omentum was much injected. The liver and spleen were slightly enlarged. The kidneys were normal.

CASE 477.—Private James F. Lynch, company H, 20th Massachusetts volunteers; age 30; admitted December 2, 1862. Chronic diarrhœa of eight weeks' duration. [This man appears on the sick report of his regiment as under treatment for diarrhœa from April 23d to April 27, 1862.] He was extremely emaciated, had large, liquid, and very frequent stools, which, during the last twenty-four hours of his life, were involuntary. Treatment: Astringents, opiates, stimulants and concentrated food. Died, December 7th. *Autopsy:* Body extremely emaciated; abdomen sunken. The thoracic viscera were normal. The mesentery was injected; the mesenteric glands enlarged. The mucous membrane of the small intestine was softened, particularly in the lower part of the ileum. The liver was somewhat enlarged and fatty. The spleen large and soft. [The condition of the large intestine is not recorded.]

CASE 478.—Private George H. Kline, company I, 23d Pennsylvania volunteers; admitted December 20, 1862. Chronic diarrhœa. Died, December 31st. *Autopsy:* Body greatly emaciated. There were extensive peritoneal adhesions; the omentum, the mesentery, and the peritoneal coat of the intestines much injected. The mucous membrane of the stomach and small intestine was injected and softened. [The condition of the large intestine is not recorded.]

CASE 479.—Private George A. Chamberlain, company A, 73d Ohio volunteers; admitted from the field hospital of the 11th Corps, Fairfax Court-House, Virginia, December 16, 1862. Chronic diarrhœa of long standing. He was extremely feeble

and much emaciated; had on an average ten stools daily, accompanied by pain in the bowels. The abdomen was tender on pressure; pulse frequent and feeble; tongue red and smooth. Stimulants and astringents were administered, and warm fomentations applied. Died, January 12, 1863. *Autopsy:* The lower lobes of both lungs were slightly congested. The heart was normal. The mucous membrane of the stomach was extremely pale; that of the ileum, especially in its lower part, was softened, and coated with a puruloid exudation. The colon was moderately congested. The mesenteric glands were much enlarged. The spleen enlarged. The liver enlarged and softened.

CASE 480.—Private John Fry, company G, 6th Maine volunteers; admitted December 20, 1862. Chronic diarrhœa. Died, January 17, 1863. *Autopsy:* The skin was unusually discolored; body greatly emaciated. The liver was small and lighter colored than usual; it was adherent to the diaphragm. The bloodvessels of the peritoneum covering the abdominal viscera were greatly injected. The colon exhibited signs of chronic inflammation. The mesenteric glands were enlarged and softened.

CASE 481.—Private J. H. Watkins, company E, 73d Ohio volunteers; admitted January 22, 1863. General debility. [This man appears on the register of the hospital of the 2d Division, 11th Corps, Fairfax Court-House, Virginia, admitted November 3, 1862—phthisis; no disposition recorded.] Died, February 2d, eleven days after admission. *Autopsy* eighteen hours after death: Body much emaciated. The heart was very small; the coronary vessels tortuous, like varicose veins. There were firm pleuritic adhesions on the left side; in other respects the thoracic viscera were healthy. The abdominal viscera also appeared to be healthy, except that there was some ulceration of the mucous membrane of the small intestine.

CASE 482.—Private John Wyatt, company B, 75th Ohio volunteers; admitted from the hospital of the 11th Corps, Fairfax Court-House, Virginia, January 22, 1863. Chronic diarrhœa of long standing. The patient was at first able to sit up and walk around a little, but soon grew feeble, and was confined to bed. He was somewhat emaciated. At the date of admission the discharges from the bowels were watery, more or less yellowish, and varied in frequency from half a dozen to a dozen in the twenty-four hours; they were attended with some little pain and tenesmus; there was more or less abdominal tenderness, and occasional colicky pains, which, however, were not severe; the stomach was irritable, and there was considerable nausea, especially after taking food, drink, or medicine; he had but little appetite for food, and complained of constant thirst; the pulse was small, frequent and feeble; the respiration unembarrassed. Treatment: Various astringents, especially acetate of lead, sulphate of copper, and tannic acid, were successively employed in combination with opium; occasionally a small dose of castor oil was administered; cod-liver oil in moderate doses was given as an analeptic; it was administered in peppermint-water, and was tolerated by the stomach better than any other medicine tried; rubefacients were applied to the abdomen. Milk, eggs, and farinaceous articles were mainly employed as food, and gum-water, toast-water, and tea for drink; but there seemed to be no power to assimilate nutriment, and the patient gradually sank, his intellect remaining clear to the last. Died, February 13th. *Autopsy* ninety hours after death: Body extremely emaciated. The thoracic viscera were normal. The stomach was healthy. There were patches of inflammation in the ileum, but no enlargement or ulceration of the glands of Peyer; there was a well-marked intussusception about an inch long in the lower part of the ileum. The omentum was atrophied, its bloodvessels injected. The mesenteric glands were enlarged. The liver was healthy. [There is no record of the condition of the large intestine.]

CASE 483.—Private Luke Lee, company E, 2d Maryland Cavalry; admitted February 12, 1863. Chronic diarrhœa of over two months' standing. The patient was much emaciated; had no appetite; great thirst; eight or ten painful passages daily. In the treatment astringents were chiefly relied upon, with Dover's powder or sulphate of morphia at night to induce sleep. Strict attention was paid to the diet, only farinaceous food being allowed. The patient improved gradually, and during the second week in March was allowed to have his clothes. He took cold March 16th. The diarrhœa recurred more severely than ever; he became very much prostrated, and died April 14th. *Autopsy* ten hours after death: The middle and lower lobes of the right lung were congested. There was great constriction and thickening of the coats of the large intestine in the vicinity of the sigmoid flexure, the lumen of the bowel being diminished to about one-fourth its natural diameter.

CASE 484.—Private Donald McIvor, company I, 15th Vermont volunteers; admitted April 14, 1863. Chronic diarrhœa. [This man appears on the hospital register of his regiment admitted March 25th—measles—sent to general hospital April 14th.] The patient was feeble and emaciated; he had from six to eight watery stools in the twenty-four hours; abdomen tender and painful; pulse frequent and feeble; tongue dry, red and smooth; no appetite. Treatment: Stimulants, alteratives, fomentations to the abdomen. Died, May 19th. *Autopsy:* Body greatly emaciated; abdomen sunken. The lungs were slightly congested. The heart normal. The peritoneum covering the intestines was discolored. The mucous membrane of the ileum was softened; that of the large intestine not materially altered. The liver and spleen were somewhat enlarged. The kidneys were healthy.

CASE 485.—Private J. E. Potts, company A, 137th New York volunteers; age 45; admitted June 17, 1863. Diarrhœa. [This man appears on the hospital register of his regiment, sent to general hospital June 16, 1863—fever and blistered feet.] The symptoms yielded readily to treatment. The patient improved in health, was able to eat his full ration, and was confined to bed but a portion of the time. June 27th: He complained of pain in the chest, accompanied by some dyspnœa; pulse not much accelerated. A blister was applied, and a combination of expectorants and anodynes directed. During the night he grew worse; his respiration became very laborious; he sank rapidly, and died June 28th, at 7 A. M. *Autopsy* twenty-four hours after death: Almost the whole of both lungs was congested. Nothing else abnormal was observed.

CASE 486.—Private David Keener, company F, 1st Pennsylvania cavalry; age 41; admitted June 28, 1863. Chronic diarrhœa of two months' duration. Died, July 12th. *Autopsy* eighteen hours after death: Great emaciation. The heart and lungs were healthy. The mucous membrane of both small and large intestine was inflamed and softened. There were a few ulcers in the colon. The liver and spleen were somewhat enlarged.

CASE 487.—Private John C. Fox, company F, 16th Pennsylvania cavalry; age 23; admitted June 28, 1863. Chronic diarrhœa of four months' duration. The patient was much emaciated; had the physical signs of a deposit of tubercle in the

left lung, and at the time of admission, from fifteen to twenty discharges from the bowels daily. He was placed upon an alterative and sustaining treatment, which slightly checked the diarrhœa. July 9th: He had an attack of hæmorrhage from the lungs, which was quite profuse at first, but lasted only a short time; and subsequently he continued to improve under treatment. August 15th: An almost total suppression of urine occurred. He was catheterized from time to time, but only a few drops of urine were obtained. This condition continued until death. Died, August 20th. *Autopsy* fourteen hours after death: There was an abundant deposit of softened tubercle in the left lung, a few scattered tubercles in the right; extensive pleuritic adhesions on the right side. The mucous membrane of both small and large intestine was inflamed, softened and ulcerated. The liver, spleen and kidneys appeared to be perfectly normal.

Case 488.—Private A. Jerome Northrup, company G, 141st New York volunteers; admitted September 26, 1863. Chronic diarrhœa. The patient was much emaciated. The discharges from the bowels averaged ten daily; they were accompanied by great pain and tenesmus. He had a slight cough and a dull heavy pain in the lower part of the right lung, with the physical signs of pneumonia in the first stage. September 28th: Is somewhat better; there are now but four passages daily. October 2d: Copious diaphoresis, with cramps in the lower extremities. Died, October 4th. *Autopsy* ten hours after death: The lower lobe of the right lung was congested. The mucous membrane of the ileum was much inflamed; its solitary and agminated glands were enlarged. There was considerable thickening and contraction of the gut in the vicinity of the ileo-cæcal valve. The liver was much enlarged. [There is no record of the condition of the large intestine.]

Case 489.—Private Joseph Berger, company I, 1st New York artillery; admitted September 26, 1863. Chronic diarrhœa of long standing. Has ten or twelve discharges per day; is much emaciated; suffers little pain. Treatment: Tonics, alteratives, opiates and astringents. Died, October 4th. *Autopsy* eight hours after death: The lungs were healthy. The spleen was congested. Throughout the whole intestinal tract more or less thickening was observed; the colon was contracted; the mucous membrane of the sigmoid flexure softened.

Case 490.—Private William Evans, company E, 152d New York volunteers; admitted from regimental hospital October 17, 1863. Chronic diarrhœa of eight months' duration. The patient was extremely debilitated, and had a severe cough. Treatment: Tonics, alteratives, opiates, blisters to the abdomen. Died, November 2d. *Autopsy:* Body greatly emaciated. The lower lobe of the left lung was congested; the rest of the left lung and the whole of the right were healthy. Some thickening of the stomach was observed around the pyloric orifice. The mucous membrane of the ileum was softened, and near the ileo-cæcal valve it was ulcerated. The whole colon was very much contracted.

Case 491.—Private Stephen Benson, company F, 7th Michigan cavalry; age 25; admitted July 19, 1863. Chronic diarrhœa. This patient presented every symptom of a confirmed lunatic, and it was stated by men of his regiment that he was idiotic when enlisted. He was very much debilitated; had suffered from diarrhœa for nearly five months; his pulse was 100 and feeble, and he labored under incontinence of urine. Treatment: Tonics and astringents; a blister over the abdomen. The diarrhœa was checked for a time, but dropsy made its appearance, and subsequently the flux returned in an aggravated form. Died, November 2d. *Autopsy* eight hours after death: The body was œdematous. There were slight pleuritic adhesions on the left side. The lungs were healthy. The heart was slightly enlarged. The liver was congested. The spleen was much enlarged and congested, weighing three pounds ten ounces. The lower portion of the ileum was thickened, but no ulcers were observed. [There is no record of the condition of the large intestine.]

Case 492.—Private Henry L. Hewitt, company E, 154th New York volunteers; admitted September 27, 1863. Chronic diarrhœa. This patient was intemperate in his habits, and when admitted had some symptoms of delirium tremens. Died, November 8th. *Autopsy* sixteen hours after death: Body greatly emaciated. The stomach and intestines were anæmic; there was some thickening of the stomach about the pyloric orifice The mucous membrane of the ileum was softened, and its solitary follicles were enlarged. The sigmoid flexure of the colon was greatly contracted. No ulceration could be seen in any portion of the intestines.

Case 493.—Private Adam Scott, company G, 143d New York volunteers; age 59; admitted September 26, 1863. Chronic diarrhœa of five months' duration. [This man appears on the hospital register of his regiment, sent to general hospital September 24th—typhoid fever.] The patient was greatly emaciated; his stomach very irritable; he had severe tenesmus, and passages from the bowels almost every half hour through the day and night. Treatment: Tonics, alteratives, astringents and opiates. Died, November 9th. *Autopsy* twenty hours after death: Body much emaciated; there were old pleuritic adhesions on both sides. An intussusception four inches long was found in the ileum. The whole length of the colon was contracted, its lumen being about half an inch in diameter. The liver was small.

Case 494.—Private Amasa Whittemore, company B, 83d New York volunteers; age 32; admitted October 16, 1863. Chronic diarrhœa. This man was jaundiced, complained of pain in the right hypochondriac region, and of severe gastralgia. His urine was high colored. He had about eight loose stools daily. Treatment: Diaphoretics, alteratives and opiates. He passed into a typhoid condition, with small feeble pulse; his abdomen became tympanitic. For some time before death stimulants were freely administered. Died, November 13th. *Autopsy:* The lungs were congested. The ileum and colon were greatly contracted and thickened; there were three intussusceptions in the space of fourteen inches in the upper part of the ileum.

Case 495.—Private Nelson Kinney, company G, 26th Michigan volunteers; age 27; admitted from regimental hospital October 17, 1863. Chronic diarrhœa. This patient was much emaciated, and had lost thirty pounds during three months. He had ten or twelve passages a day, accompanied by some tenesmus. Treatment: Astringents, alteratives and opiates. Died, November 15th. *Autopsy* fourteen hours after death: There was a deposit of miliary tubercles and an abundance of pigment in both lungs. The ileum and colon were greatly contracted but not ulcerated.

CASE 496.—Private Robert Alexander, company E, 149th Pennsylvania volunteers; age 18; admitted December 6, 1863. Typhoid fever. When admitted, this man was suffering from diarrhœa; his stomach was irritable; his urine scanty and high colored; his tongue red and dry. Treatment: Alteratives, turpentine, supporting diet. December 18th: There is more or less stupor, subsultus tendinum, involuntary stools. Died, December 21st. *Autopsy* nine hours after death: The lungs were healthy. The mucous membrane of the stomach was softened. The descending colon was thickened and softened, but no ulceration could be found. The liver was normal.

CASE 497.—Corporal David A. McClure, company I, 149th Pennsylvania volunteers; age 27; admitted December 7, 1863. Chronic diarrhœa. [This man appears on the register of the hospital of the 3d Division, 1st Corps, admitted April 20th—debility—returned to duty May 3d; admitted September 11th—diarrhœa—returned to duty September 17th; admitted November 3d—diarrhœa—returned to duty December 2d.] The patient was very much emaciated and debilitated by protracted diarrhœa; the discharges were watery and not accompanied by much pain. Treatment: Alteratives, tonics, astringents, opiates; extra diet. Died, January 1, 1864. *Autopsy* five hours after death: Body greatly emaciated. The lungs were comparatively healthy. The mucous membrane of the whole small intestine was thickened. The colon was very little thickened.

CASE 498.—Private Solomon Leasure, company I, 149th Pennsylvania volunteers; admitted December 6, 1863. Chronic diarrhœa. Died, January 29, 1864. *Autopsy* thirty hours after death: Great emaciation. The heart and lungs were perfectly healthy; there were no pleuritic adhesions. The ileum was contracted in several places, the colon throughout almost its whole extent; the coats of the colon were thickened and indurated. The liver and spleen were healthy; the mesenteric glands enlarged. The kidneys were somewhat firmer than natural.

CASE 499.—Private James Ainsworth, company I, 5th Pennsylvania reserves; age 19; admitted from regimental hospital February 12, 1864. Acute dysentery. [This man appears on the hospital register of his regiment, sent to hospital February 12—dysentery.] Pneumonia of an asthenic type supervened almost immediately after his admission. Treatment: Dover's powder, dry cups to the chest, milk-punch. The dysenteric symptoms subsided, and there were no discharges from the bowels for several days before death. Died, February 23d. *Autopsy* eighteen hours after death: The lower lobe of the right lung was in the stage of gray hepatization, the other lobes in the stage of red hepatization; the left lung was congested. The intestines presented no evidences of serious disease.

CASE 500.—Private David B. Jones, company H, 148th Pennsylvania volunteers; age 29; admitted from regimental hospital March 24, 1864. Chronic diarrhœa. The patient, who was of a scrofulous constitution, had suffered from diarrhœa for four months, and was much exhausted. A dose of castor oil and laudanum was administered immediately after he entered hospital; subsequently he took pills of tannic acid and opium. Under this treatment the number of stools was speedily reduced to one daily; nevertheless he rapidly sank, and died comatose, March 30th. *Autopsy:* Both lungs contained tubercles, which were especially abundant in the upper lobe of the right lung; this lobe was also the seat of an abscess containing about an ounce of fluid. The stomach and small intestine were healthy. The mucous membrane of the colon was thickened, softened, and ulcerated. The spleen contained numerous tubercles.—Surgeon E. Bentley, U. S. V. [Nos. 295 to 298, Medical Section, Army Medical Museum, are from this case. No. 296 is a portion of the ascending colon near the cæcum; No. 297 a portion of the right extremity of the transverse colon; in both the mucous membrane is considerably thickened, and presents follicular ulcers, which are most numerous in No. 296. No. 298 is the spleen, with a number of small tubercles just beneath its peritoneum.]

CASE 501.—Private Henry Nunemaker, company D, 187th Pennsylvania volunteers; age 19; admitted from City Point, Virginia, July 2, 1864. Typhoid fever. Died, July 15th, at 6.30 P. M. *Autopsy* fifteen hours and a half after death: Body very much emaciated. The heart, lungs, liver and spleen were normal. There was extensive inflammation of the stomach and the whole intestinal canal, with numerous large and indurated ulcers in the ileum, cæcum, colon and rectum.

CASE 502.—Private Charles W. Akley, 7th Maine battery; age 16; admitted July 4, 1864. Chronic diarrhœa. This patient had been ill five weeks, and was so much debilitated as to be unable to walk. His appetite was poor, and he had much thirst; tongue whitish; pulse 90 to 100. He had ten or eleven stools daily, accompanied by griping pain in the abdomen, and tenesmus. Gave a dose of castor oil followed by chalk-mixture and laudanum. July 6th: Has seven stools daily, but no longer complains of abdominal pain. To have a nutritious diet and stimulants in small quantities. July 12th: Appetite poor. Prescribed a mixture containing aromatic sulphuric acid and laudanum. Died, July 17th, at 3 P. M. *Autopsy* eighteen hours after death: Body much emaciated. Many large ulcers were found in the ileum, cæcum, and colon. The other organs were healthy.—Surgeon E. Bentley, U. S. V. [Nos. 422 and 423, Medical Section, Army Medical Museum, are from this case. No. 422 is a portion of the transverse colon, which presents a number of large irregular ulcers such as are observed in diphtheritic dysentery after the separation of the sloughs; the muscular coat is exposed at the bottom of the ulcers. No. 423 is a portion of the descending colon with similar ulcers, some of which, however, penetrate to the peritoneum, while from the edges of some the mucous membrane hangs in shreds.]

CASE 503.—Private Nathaniel Rowe, company G, 44th New York volunteers; age 50; admitted from the hospital of the 1st Division, 5th Corps, City Point, Virginia, July 2, 1864. Chronic diarrhœa. Died, July 23d, at 1 P. M. *Autopsy* twenty-two hours after death: Body much emaciated. There was extensive pleuro-pneumonia on the right side. The liver was large and congested. The mucous membrane of the colon was inflamed.

CASE 504.—Private Joseph Wilkins, company C, 97th New York volunteers; age 23; admitted July 2, 1864. Chronic diarrhœa. [This man appears on the hospital register of his regiment, admitted December 9, 1863—diarrhœa—returned to duty December 16th; admitted March 24, 1864—chronic diarrhœa—returned to duty April 8th; admitted April 14th—diarrhœa—

returned to duty April 16th; admitted April 25th—diarrhœa—returned to duty April 28th; admitted June 10th—diarrhœa—sent to division hospital June 11th. He appears on the register of the hospital of the 3d Division, 5th Corps, admitted June 12th—diarrhœa—sent to corps hospital June 21st. He is borne on the register of the depot hospital of the 5th Corps, City Point, Virginia, admitted June 24th—sent to general hospital July 1st.] Died, July 23d. *Autopsy* six hours after death: Both lungs were extensively inflamed; the pleural sacs contained about half a pint of fluid. The heart and liver were normal; the gall-bladder was distended with bile. The mucous membrane of the large intestine was extensively inflamed and ulcerated.

CASE 505.—Corporal William Powell, company K, 16th New York cavalry; age 43; admitted from Falls Church, Virginia, July 13, 1864. Chronic diarrhœa. In this case the symptoms so closely resembled those of typhoid fever in its advanced stages that the disease was so registered. Died, July 24th, at 4 A. M. *Autopsy* six hours and a half after death: Body greatly emaciated. The lower lobe of the right lung was hepatized, and attached by slight pleuritic adhesions to the thoracic parietes. The liver was large and fatty. The spleen much enlarged and full of blood. Two intussusceptions were found in the ileum. There were many large ulcers in the lower two feet of the ileum, and in the large intestine from the ileo-cæcal valve to the anus.—Surgeon E. Bentley, U. S. V. [No. 419, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon, presenting numerous follicular ulcers, many of which are circular in form, with the diseased follicle remaining in the centre of the ulcer.]

CASE 506.—Private William Cousins, company I, 31st Maine volunteers; admitted July 6, 1864. Chronic diarrhœa. Died, August 1st. *Autopsy* six hours after death: There was extensive ulceration of the ileum, cæcum, colon and rectum, with a general inflammatory condition of the whole intestinal canal and thickening of the mucous membrane.

CASE 507.—Private Smith Ward, company A, 149th Pennsylvania volunteers; age 16; admitted July 3, 1864. Acute diarrhœa. Died, August 1st. *Autopsy* twenty-three hours after death: Body slender and emaciated. There was inflammation of the right lung and pleura. The ileum, cæcum and colon were inflamed and ulcerated.

CASE 508.—Quartermaster Sergeant Hans C. Frederickson, 3d Veteran Reserve Corps; age 24; admitted from regimental quarters July 22, 1864. Acute dysentery. At the time of admission the patient was suffering from frequent hæmorrhagic discharges from the bowels, with tenesmus, accompanied by very severe pains in the lower part of the abdomen. He had been sick two or three weeks, but the symptoms had only recently become severe. About two months previously his horse had thrown him, and in falling had injured him in the right iliac region with the pommel of the saddle. He stated that he vomited a large quantity of blood at the time of the accident, and had not entirely recovered from the effects of the injury, when he was attacked with diarrhœa which soon became dysenteric in character. He was at first treated with quinine, as there seemed to be periodical exacerbations of the symptoms; diaphoretics were also administered, and enemata of starch-water and laudanum. He improved for a few days, after which the symptoms again became more severe. Alteratives, astringents and stimulants were used without effect. He remained perfectly conscious till a very short time before his death. During the twenty-four hours immediately preceding dissolution the evacuations were almost pure blood, and he presented all the appearances of one suffering from exhausting hæmorrhage. Died, August 4th. *Autopsy* twenty-four hours after death: Body considerably emaciated. The stomach was inflamed. The mucous membrane of the colon and rectum presented a number of large deep ulcers, some of which extended to the peritoneal coat. The cæcum adhered to the walls of the abdomen for a space the size of a silver dollar. The other organs appeared to be healthy.

CASE 509.—Private William Down, company F, 187th Pennsylvania volunteers; admitted August 1, 1864. Chronic diarrhœa. [This man appears on the register of the Augur hospital, near Alexandria, Virginia, admitted July 28th—remittent fever—sent to general hospital August 1st.] Died, August 8th. *Autopsy* sixteen hours after death: Body greatly emaciated. There was extensive inflammation of the left lung and pleura. The pericardium was firmly adherent to the heart at every point, and there was some disease of the auriculo-ventricular valves. The lower portion of the ileum, the cæcum, and the colon were ulcerated, and there was much thickening of the mucous membrane.

CASE 510.—Edward Phipps, bugler, company K, 2d Massachusetts cavalry; admitted from the Provost Marshal, July 26, 1864. Typhoid fever. Died, August 9th. *Autopsy* twelve hours after death: Body much emaciated. An extensive deposit of tubercle was found in the right lung, and there was considerable inflammation of the lung and pleura. The other organs of the chest were healthy. Marked ulceration of lower portion of ileum, cæcum, and colon was observed. The other abdominal organs were healthy.

CASE 511.—Private Harrison Aber, company B, 14th New York artillery; admitted from Soldiers' Rest May 8, 1864. Remittent fever. Died, August 9th, of chronic diarrhœa. *Autopsy* fourteen hours after death: Body somewhat emaciated. The liver and spleen were engorged. The ileum, colon and rectum were ulcerated.

CASE 512.—Private Eli Merrill, company E, 58th Massachusetts volunteers; admitted from the army of the Potomac June 15, 1864. Acute diarrhœa. Died, August 9th. *Autopsy* eighteen hours after death: Body considerably emaciated. The mucous membrane of the stomach and of the whole intestinal canal was inflamed. The heart was very small. The mucous membrane of the bladder was much congested. The other organs were healthy.

CASE 513.—Corporal George Martin, company B, 110th Ohio volunteers; admitted August 10, 1864. Typhoid fever. [This man appears on the register of the depot hospital of the 6th Corps, admitted July 6, 1864—diarrhœa; no disposition.] The patient was insensible at the time of admission, and died next day. *Autopsy* twenty hours after death: Body much emaciated. There was extensive ulceration of the ileum, cæcum and colon, and considerable thickening of the mucous membrane.

CASE 514.—Private A. P. Knox, 8th company, New York sharpshooters; admitted July 2, 1864. Acute diarrhœa. [This man appears on the register of the hospital of the 4th Division, 5th Corps, admitted June 21st—acute diarrhœa—sent to

depot hospital June 24th. His name is borne on the register of the depot hospital of the 5th Corps, City Point, Virginia, sent to general hospital July 21st.] Died, August 13th. *Autopsy* four hours after death: Body much emaciated. There was extensive inflammation of the rectum, and ulceration of the cæcum and colon. The other organs were normal.

CASE 515.—Private Jared Seymour, company D, 19th New York cavalry; age 29; admitted from Prince street prison August 15, 1864. Chronic diarrhœa and insanity. [This man appears on the register of Lincoln hospital, Washington, D. C., admitted March 25, 1864—insanity—deserted April 1st.] The patient was exceedingly emaciated, passed his stools and urine involuntarily, and was much deranged in mind. It was found necessary to watch him constantly to prevent him from swallowing the medicine prescribed for others, which he would do regardless of taste or consequences. Alteratives, astringents and stimulants were tried without beneficial effect. Died, August 27th. *Autopsy:* Brain not examined. The lungs were healthy. No inflammation of the mucous membrane of the small or large intestine was detected. The liver and spleen were soft and dark colored, breaking down readily under pressure.

CASE 516.—Private James Carroll, company K, 84th New York volunteers; age 55; admitted August 8, 1864. Acute diarrhœa. Died, September 2d. *Autopsy* two hours and a half after death: No rigor mortis; no stasis; body much emaciated. There was some effusion of serum beneath the arachnoid; the brain-substance was normal, or a trifle harder than usual; the lateral ventricles contained three or four drachms of serum; the middle commissure of the brain was absent. There was an abscess in the left parotid gland. The lungs were of a gray color mottled with black, and were adherent on both sides by firm bands to the thoracic parietes and the diaphragm. The heart was normal; its right ventricle contained a mixed clot, both auricles yellow clots. The liver was small, pale, and rather free from blood. The spleen two inches and a half long by an inch and a half wide. The kidneys were normal. The transverse colon, descending colon and rectum were of a dark-red color, and presented numerous ulcers. The ileum was not inflamed. The mesenteric glands not enlarged.

CASE 517.—Private Morris Biederman, company I, 39th New York volunteers; admitted August 11, 1864. Acute diarrhœa. [This man appears on the register of the hospital of the 1st Division, 2d Corps, admitted July 24th—intermittent fever; no disposition; and on the register of the depot hospital of the 2d Corps, admitted July 27th—convalescent; no disposition.] Died, September 5th, at 7 A. M. *Autopsy* four hours after death: Body very much emaciated. The lower lobe of the left lung was hepatized, the left bronchial tubes inflamed; the right lung was healthy. The heart was normal. The liver of the ordinary size. The spleen small. The ileum was inflamed, with slightly enlarged solitary glands. The colon was similarly affected and inflamed, especially at the caput coli; it contained some fluid fæces.

CASE 518.—Private Robert B. Craig, company M, 2d New York heavy artillery; age 26; admitted August 11, 1864. Typho-malarial fever. He had previously suffered from chronic diarrhœa. At the time of admission he had some fifteen fetid watery stools daily, and there was excessive tenderness in the right iliac region; he was emaciated and debilitated; pulse 93 and feeble. As he seemed quite feverish, solution of acetate of ammonia was prescribed, combined with tincture of aconite; for the diarrhœa a turpentine mixture, and subsequently Hope's camphor mixture; stimulants were also administered. The diarrhœa was readily controlled, the febrile symptoms abated, and his condition seemed favorable, when a severe cough set in accompanied by excessive expectoration. Expectorants, tonics and stimulants were employed, and counter-irritants applied to the chest, but without benefit. Died, September 5th. *Autopsy* seven hours after death: There were tubercles in both lungs, and numerous purulent spots about the size of a cherry; the right middle lobe was the only one not affected. The heart was normal. The sigmoid flexure and descending colon were inflamed, and presented spots of ulceration the size of peas. The mucous membrane of the ileum was somewhat inflamed. The other abdominal viscera were normal.

CASE 519.—Private Emmanuel Straw, company I, 58th Pennsylvania volunteers; age 50; admitted from Prince street prison September 24, 1864. Chronic diarrhœa. This case was complicated with hemorrhoids and great irritability of the stomach. An unusual degree of jactitation was noticed during the last week of his life. Died comatose, October 20th. *Autopsy* eight hours after death: There was an excess of black pigment on the surfaces of the lungs, which were otherwise healthy; the lower lobe of the right lung was adherent to the thoracic parietes. The mucous membrane of the small intestine was inflamed throughout its whole length. The colon was extensively ulcerated. The liver was unusually large, and presented the nutmeg appearance. The kidneys were fatty.

CASE 520.—Private Eliphalet Phillips, company M, 10th New York cavalry; age 18; admitted August 15, 1864. Chronic diarrhœa. [This man appears on the register of the hospital of the Cavalry Corps, army of the Potomac, admitted July 31st—diarrhœa—sent to general hospital August 9th.] He had been sick about three months. At the time of admission the average number of stools was about five daily, and he was very much emaciated. About the first of October the patient was attacked with bronchitis, for which diaphoretics and expectorants were administered with benefit, but a slight cough remained. Died, November 1st, at 5 P. M. During the progress of this case astringents, tonics, ipecacuanha and opium were used in various combinations in connection with nutrients and stimulants. *Autopsy* fifteen hours after death: Body very rigid and much emaciated. The pericardium contained two ounces of light-colored serum. The heart was normal. The lungs were small; the left lung was highly congested; the upper lobe of the right lung contained many softened tubercles. The bronchial tubes were filled with pinkish frothy mucus. The stomach contained about four ounces of partly digested food. The mucous membrane of the small intestine was highly congested, in some parts inflamed; the last eight inches above the ileo-cæcal valve presented some patches of ulceration. The colon was highly congested, inflamed in some parts, with indications of incipient ulceration. The mesenteric glands were tuberculous. The liver was large, pale outside, mottled inside; the gall-bladder contained half an ounce of yellow inspissated bile. The spleen, pancreas and kidneys were normal. The bladder was empty.

CASE 521.—Private Francis M. Fox, company K, 109th New York volunteers; age 23; admitted from Augur hospital July 20, 1864. Consumption. [This man appears on the register of the Mount Pleasant hospital, Washington, D. C., admitted June 21st—contusion of lumbar region by falling from a tree; returned to duty June 22d. He appears on the register of the

Augur hospital, near Alexandria, Virginia, admitted July 4th—chronic rheumatism—sent to general hospital July 20th.] The patient was suffering from an exhausting diarrhœa and was much emaciated; his cough was not severe. There was dulness on percussion over the whole of the right lung. Treatment: Astringents, expectorants, cod-liver oil, stimulants and a nutritious diet. The diarrhœa was readily controlled, but the chest-symptoms were persistent. Died, November 13th. *Autopsy* eighteen hours after death: Body moderately rigid and much emaciated; several nævi materni were observed on the right hip. The right lung was infiltrated with miliary tubercles, and had several cavities in its upper lobe; the left lung was also tuberculous, but less diseased than the right; its upper lobe was adherent to the parietes of the chest. The mucous membrane of the trachea was ulcerated. The heart was small but normal; there was a small clot in the left ventricle; the large veins and arteries were nearly empty. The liver was enlarged; the gall-bladder empty. The spleen enlarged and filled with black blood. The mesenteric glands were cheesy. The small intestine was ulcerated in several places, in others presented distinct pustules; [?] three distinct intussusceptions of the small intestine were observed. The large intestine was congested and presented a number of ulcers. The kidneys were enlarged; the urinary bladder contained eight ounces of light-colored urine.

Case 522.—Recruit George Wayne, 79th New York volunteers; age 18; admitted September 9, 1864. Acute diarrhœa. [This man appears on the register of the Augur hospital, near Alexandria, Virginia, admitted September 5th—remittent fever—sent to general hospital September 9th.] Treatment: Hope's camphor mixture, milk-punch, &c. The diarrhœa was speedily brought under control, but several relapses took place, and the patient remained weak. November 20th: Typhoid symptoms set in, and a turpentine mixture was prescribed. November 23d: He was attacked by diphtheria, and died November 29th. In the treatment of this last complication milk-punch was given freely, and the throat swabbed alternately with solution of chlorate of potassa and dilute acetic acid. A large quantity of pseudomembrane was thus removed. *Autopsy* thirteen hours after death: The pharynx, larynx, trachea, and bronchial tubes were inflamed, and presented ulcerated patches. The upper lobes of both lungs were pneumonic. The liver and spleen were much enlarged and softened, the latter being very soft; the gall-bladder was distended with bile. There was extensive inflammation and ulceration of the mucous membrane of the bowels. In the cæcum several cicatrices of former ulcers were observed.

Case 523.—Sergeant William F. Tousley, company K, 6th Ohio cavalry; age 27; admitted from City Point, Virginia, November 30, 1864. Diarrhœa. [This man appears on the register of the hospital of the 2d Division of the Cavalry Corps of the army of the Potomac, admitted November 2d—remittent fever—sent to depot hospital November 20th. He is borne on the register of the depot hospital of the Cavalry Corps, City Point, Virginia, admitted November 20th—diarrhœa—sent to general hospital November 29th.] Was much emaciated and exhausted; complained of pain in the bowels; had suffered from diarrhœa for several weeks before admission. Three blue-mass pills were given, followed by castor oil; afterward opiates, stimulants and astringents. He continued to have on an average five or six stools daily, and gradually failed. The last week of his illness he had but two or three evacuations daily. Died, December 6th. *Autopsy* twelve hours after death: There was some engorgement of the posterior portion of both lungs. The pericardium was adherent to the heart. The liver presented the nutmeg appearance. The spleen was very small. The mucous membrane of the intestines was considerably injected; this was most marked in the large intestine. In the descending colon, sigmoid flexure, and rectum the mucous membrane was ulcerated.

Case 524.—Private Michael Clancey, 102d company, 2d battalion, Veteran Reserve Corps; age 26; admitted May 25, 1864. Diarrhœa. Had been sick three weeks. This man was wounded in the left arm at Malvern Hill, July 1, 1862, in consequence of which he suffered amputation of the humerus at the junction of the middle and upper thirds August 15th. He was subsequently transferred to the Veteran Reserve Corps. The first notes of the case were taken August 25, 1864. He had then from eight to twelve feculent stools daily, with some nausea and griping. Alteratives and astringents were prescribed. A few weeks later he complained of cough and pain in the upper part of his chest. On percussion, considerable dulness was observed below the left clavicle and extending over the upper portion of the left lung; over the same region rude respiration and a slight mucous rale were heard. His diarrhœa now averaged from five to six passages daily. Cod-liver oil and syrup of iodide of iron were added to the former remedies, but without permanent benefit. He began to emaciate, became very low-spirited, lost his appetite, and soon took to his bed. Finally the stools became involuntary, and he died December 13th. Some two weeks before death an abscess formed near the anus and discharged a thick dark-colored pus. *Autopsy* twenty-four hours after death: The body was greatly emaciated. The pericardium was filled with serum mixed with lymph. Both lungs contained tubercles and vomicæ, the upper part of the left lung being most extensively diseased. The spleen was normal; the liver and kidneys fatty; the mesenteric glands enlarged. There was tubercular ulceration of the ileum. The mucous membrane of the colon was thickened and presented numerous ulcers. The vermiform appendix was adherent to the upper part of the rectum, and the cavities of the two communicated through an ulceration. On the left side of the anus was an incomplete fistula leading to an abscess cavity the size of a walnut.—Acting Assistant Surgeon W. C. Minor. [Nos. 463 and 464, Medical Section, Army Medical Museum, are from this case. No. 463 is from the upper portion of the ileum, and presents near its centre a group of small irregular ulcers, opposite which, on the peritoneal surface, there are a number of minute tubercles. No. 464 is the lower part of the rectum, with a portion of the skin surrounding the anus; the mucous membrane is thickened, and presents numerous small follicular ulcers; at the margin of the anus there are two small fistulous orifices communicating with an abscess-cavity rather larger than a walnut, situated in the areolar tissue just outside the sphincter ani.]

Case 525.—Private Calvin Clements, company C, 5th Pennsylvania heavy artillery; age 19; admitted October 10, 1864. Chronic diarrhœa. He so far recovered as to be able to do the duties of an orderly in the office of the hospital. About the first of November he was attacked by fever, accompanied by cough, and pain in the right lung. This was treated by a combination of alteratives, expectorants and opium, and a blister was applied to the chest. The fever assumed a low character, and sordes accumulated on the teeth and lips. A number of small superficial abscesses made their appearance on the chest and abdomen. Twenty-five or thirty of these were opened and discharged a thick white pus, after which convalescence set in, and he got well enough to be about the ward. About December 10th he was seized with sudden congestion of the lungs, the symptoms being

difficulty in breathing, dry hoarse cough, pain across the upper portion of the chest and over most of the right lung. Stimulating expectorants and alteratives were administered, and counter-irritants applied, without benefit. Died, December 24th, at 5 P. M. *Autopsy:* Body emaciated; mark of a blister on the right side. The brain was normal, except that the middle commissure was absent; some effusion was observed beneath the arachnoid over the cerebral hemispheres. Firm white clots were found in both sides of the heart. The posterior part of the cricoid cartilage was necrosed and surrounded by a collection of pus; this abscess had no apparent opening. The bronchial glands on the right side were greatly enlarged, and one of them, at the root of the right lung, contained pus and calcareous matter. The lower lobe of the right lung was infiltrated with miliary tubercles; the intervening lung-tissue was in the early stage of pneumonia, and its posterior surface coated with a little coagulable lymph; the rest of the right lung and the whole of the left lung appeared to be free from disease. The liver was large and pale. The spleen was small, and showed on section numerous white spots, supposed to be enlarged Malpighian bodies, but was otherwise of normal appearance. The mesenteric glands were enlarged. The ileum was slightly injected, and there were pigmentary deposits in the colon. The kidneys small, quite granular, their cortical substance yellow.—Acting Assistant Surgeon W. C. Miner. [No. 467, Medical Section, Army Medical Museum, is from this case. The specimen consists of the larynx and trachea with the enlarged bronchial glands attached; the air passages are laid open posteriorly, the section passing through an abscess surrounding the cricoid cartilage, which is necrosed and lies free in the abscess-cavity.]

CASE 526.—Private Elias Markle, company E, 184th Pennsylvania volunteers; age 34; admitted from City Point, Virginia, November 30, 1864. [This man appears on the register of the field hospital of the 2d Division, 2d Corps, admitted November 15th—dropsy; no disposition; and on the register of the depot hospital of the 2d Corps, City Point, Virginia, admitted November 26th—diarrhœa—sent to general hospital November 29th, per steamer State of Maine.] The patient was considerably emaciated, and much exhausted by the journey. He had little or no appetite, and complained of frequent bloody stools accompanied by abdominal pain and tenesmus. ℞. Oil of turpentine, tincture of opium and castor oil, each one drachm, powdered gum Arabic two drachms, water five ounces. Take a tablespoonful every three hours. This relieved the tenesmus, and the blood disappeared from the stools. During the first half of December he appeared to be improving; his bowels, however, remained loose, his stomach became irritable, he complained of soreness and dryness of the pharynx; a low form of bronchitis supervened, the skin became harsh and dry, and at times the extremities were œdematous. Brandy-punch and beef-essence were freely administered, as well as opiates and astringents, but without benefit. There was no cerebral difficulty at any time. He gradually failed, and died December 30th, at 2 A. M. *Autopsy* eight hours after death: There was some engorgement of the posterior part of the lungs, and some bronchial inflammation. The heart was fatty. The liver presented the nutmeg appearance. The kidneys were small and fatty. The colon was ulcerated, particularly in the neighborhood of the ileo-cæcal valve.

CASE 527.—Private Adam Schaffer, company G, 84th Pennsylvania volunteers; age 46; admitted from City Point, Virginia, November 30, 1864. Chronic diarrhœa. [This man appears on the register of the depot hospital of the 2d Corps, City Point, Virginia, admitted November 18th—acute diarrhœa—sent to general hospital November 29th, per steamer State of Maine.] Treated with astringents, tonics, anodynes and stimulants. Died, January 3, 1865. *Autopsy* eighteen hours after death: Moderate rigor mortis. The thoracic cavity contained a small quantity of bloody serum. There were firm pleuritic adhesions on the right side. The lower lobe of the right lung was hepatized. About eight ounces of serum were found in the abdominal cavity. The liver was brownish on section, and exuded a good deal of bloody serosity. The spleen was of medium size and purplish. The mucous membrane of the jejunum and ileum was inflamed and softened in patches; the solitary glands were enlarged and ulcerated. The cæcum and rectum were ulcerated in spots. The hemorrhoidal veins were enlarged.

CASE 528.—Private William Johnson, company C, 48th Pennsylvania volunteers; admitted October 21, 1864. Chronic diarrhœa. [This man appears on the register of the depot hospital of the 9th Corps, City Point, Virginia, admitted October 1st—debility—sent to general hospital October 20th, per hospital transport Ben Deford.] The patient was very feeble, and had copious frequent stools, the discharges being thin and clay-colored. Blue mass combined with opium was given for a time, followed by mineral and vegetable astringents combined with opium, and, as the patient became weaker, gentle tonics and stimulants. Opiate and astringent enemata were frequently given to relieve the pain and tenesmus. His appetite gradually failed; he grew steadily weaker, and died February 8, 1865. *Autopsy* eighteen hours after death: Slight suggillation posteriorly; rigor mortis moderate. There were pleuritic adhesions on the left side. Both lungs were congested, and a bloody serosity exuded on section. The bronchial glands were enlarged. The stomach was normal. The mucous membrane of the jejunum presented patches of ulceration. The ileum was ulcerated as far as the ileo-cæcal valve. In the colon there were patches of bluish ulceration and discolorations, supposed to be cicatrices. The spleen was small. The kidneys were small but normal.

CASE 529.—Private David Shawley, company A, 45th Pennsylvania volunteers; age 18; admitted July 20, 1864. Chronic diarrhœa. [This man appears on the register of the Augur hospital, near Alexandria, Virginia, admitted July 4th—chronic diarrhœa—sent to general hospital July 20th.] Improved under treatment, and was on duty as a cook February 1, 1865, when he was attacked by pneumonia, and died February 18th. *Autopsy:* No rigor mortis; body still warm. There was considerable effusion in the ventricles of the brain. Both lungs contained miliary tubercles, and presented evidences of intercurrent pneumonia, which at the apices had advanced to gray hepatization; the left lung was coated with layers of whitish-yellow lymph half an inch thick, by which it was extensively connected with the thoracic parietes; there was very little serum in the pleural sac; at the apex of the right lung was a vomica the size of a pea. The heart was normal. The liver presented the nutmeg appearance. The spleen was large, of a dark-brown color, and softened. In the ileum an intussusception some three inches in length was observed, and the mucous membrane presented a number of tubercular ulcers. The corresponding mesenteric glands were as large as marbles, and contained a cheesy tubercular deposit; there were, however, no tubercles on the intestinal peritoneum.

CASE 530.—Private Jerome Benson, company C, 123d Indiana volunteers; age 18; admitted from Soldiers' Rest February 18, 1865. Diarrhœa and pleurisy. This patient had a severe diarrhœa, cough, and bloody expectoration, with pain in the chest, increased on inspiration; his skin was hot; the pulse quick. The diarrhœa diminished under astringent treatment, but the chest-symptoms became more severe, and sordes collected on the teeth and lips. February 22d: Ordered a combination of ipecacuanha with mercury and chalk. February 23d: The dyspnœa has become intense. Ordered stimulants. Died, February 23d. *Autopsy* sixteen hours after death: Body well nourished; decided rigor mortis; the marks of a blister on the right side of the chest; suggillation posteriorly. There were recent pleuritic adhesions on the left side, but no effusion in the pleural sac. In the upper lobe of the left lung there was a deposit of tubercle. The pericardium contained four ounces of light-colored serum. The heart was small but normal. The stomach was large and filled with gas; near the pyloric orifice its mucous membrane was inflamed and ulcerated. The small intestine presented a number of tubercular ulcers. The appendix vermiformis was doubled upon itself, and bound in that position by bands of lymph. The left kidney contained tubercles. The other viscera appeared to be normal.

CASE 531.—Corporal James J. Vansant, company G, 180th Ohio volunteers; age 18; admitted from Soldiers' Rest February 22, 1865. Chronic diarrhœa. Was treated with astringents and stimulants. February 25th: He was attacked with symptoms of pneumonia—cough, sanguineous expectoration, hot skin, &c. Prescribed quinine. February 28th: The symptoms assumed a typhoid character, and low muttering delirium set in. Died, March 2d. *Autopsy* seven hours after death: Body muscular and well nourished; great rigor mortis, especially in the lower limbs. There were firm pleuritic adhesions on the right side. The lower lobe of the left lung was much congested, and exuded a large quantity of bloody serosity on section. The pericardium contained four ounces of light-colored serum. The heart was normal. The spleen was soft, congested, and weighed twenty-two ounces. The liver was large and of the nutmeg character; the gall-bladder full of yellow bile. The stomach was inflamed in spots, and contained four ounces of greenish bilious matter. Peyer's glands were inflamed, and very many of them ulcerated. The large intestine was congested and inflamed. The kidneys were small and granular.

CASE 532.—Private John Powell, company G, 26th Kentucky volunteers; admitted from Soldiers' Rest February 11, 1865. Chronic diarrhœa. The diarrhœa was readily checked, but immediately afterward he had an attack of jaundice, which was treated with iodide of potassium and three grains of blue mass every other night. Under this treatment he appeared to improve rapidly, and by the 3d of March the conjunctivæ had almost regained their normal color, and the iodide of potassium was discontinued. It appears that the same evening he went to the sutler's and indulged freely in apple-pie, and about 2 A. M., March 4th, was seized with severe pain in the abdomen, accompanied by violent spasms. The nurse in attendance did not summon the attending physician until half-past seven next morning, at which time the surface of the body was of a purple hue and cold, saliva flowing from the mouth, the spasms frequent and intense. Stimulants and external friction were resorted to, but without effect. He died during the day. *Autopsy* twenty-six hours after death: The middle lobe of the right lung was hepatized. The valves of the heart were slightly thickened. There was a small quantity of serum in the peritoneal cavity. The spleen was large and soft. The glands of Peyer congested. An oval gall stone, three quarters of an inch long by one-third of an inch thick, was found in the gall-bladder.

CASE 533.—Private Edward Dorsey, company A, 3d Maryland volunteers; age 32; admitted April 26, 1865. Chronic diarrhœa. The patient was in an exhausted condition, and had marked typhoid symptoms, viz: pain in the right iliac region, sudamina, tongue coated and cracked, frequent pulse and delirium; the discharges from the bowels were bloody. Treatment: Tonics, astringents, anodynes and stimulants. A nourishing diet was ordered, but the patient was able to eat very little. Died, May 1st. *Autopsy* ten hours after death: The meninges of the brain were much congested, and a small quantity of serum was found at the base of the brain. The lungs were normal. There was a cicatrix (?) on the surface of the liver two inches long by half an inch broad. The mucous membrane of the cæcum was covered with large ulcers, many of which had nearly perforated. Evidences of general peritonitis were observed.

CASE 534.—Private Calvin Burdick, company F, 31st Illinois volunteers; age 22; admitted from regimental hospital near City Point, Virginia, May 10, 1865. Diarrhœa. Had been sick several weeks; was suffering from diarrhœa, and was somewhat emaciated and much debilitated, though he was able to sit up and walk about a little. The day after admission, while walking out of doors, he suddenly fell to the ground, was carried into the ward, and expired a few minutes after. *Autopsy* twenty-four hours after death: An abundant deposit of tubercles was found in both lungs; they were not softened, and were somewhat more numerous in the upper than in the lower portions of the lungs, and in the left lung than in the right. The heart was soft and small, but otherwise normal. The liver and spleen were apparently normal. The mesenteric glands were enlarged, but contained no tubercular matter. The mucous membrane of the intestines was congested. The kidneys pale, but otherwise normal.

CASE 535.—Private Michael K. Smith, company G, 189th New York volunteers; age 41; admitted from regimental hospital May 15, 1865. Chronic diarrhœa. The patient was very low, and complained of pain in the region of the heart; on auscultation a blowing sound was heard. ℞. Blue mass and opium of each eight grains, extract of nux vomica two grains; make eight pills. Take one every three hours. This checked the diarrhœa somewhat, and the patient appeared to improve until May 23d, when he had a severe attack of erysipelas, and died May 24th. *Autopsy* six hours after death: The lower lobe of the right lung was hepatized. The pericardium contained four ounces of serum. The valves of the heart were thickened and closed imperfectly. The liver presented the nutmeg appearance; the gall-bladder was very much distended with bile. [The state of the intestines is not recorded.]

CASE 536.—Private Noah Casner, company G, 16th Michigan volunteers; age 45; admitted from regimental hospital May 24, 1865. Typhoid fever. Had severe diarrhœa and was in a typhoid condition. Treatment: Quinine, oil of turpentine, opium, stimulants by mouth and rectum. Died, June 6th. *Autopsy* eighteen hours after death: Lungs healthy. The mucous membrane of the small intestine was inflamed; that of the large intestine extensively ulcerated. The liver was fawn-colored.

CASE 537.—Private Oliver B. Quinn, company E, 128th Indiana volunteers; age 27; admitted from Soldiers' Rest February 20, 1865. Chronic diarrhœa and rheumatism. By May 16th the diarrhœa had ceased, but the patient presented the physical signs of phthisis. He had severe night-sweats, a troublesome cough, and profuse expectoration of very thick sputa mingled with blood. At times the diarrhœa recurred, but was always easily controlled by astringents. The general treatment consisted in the use of expectorants and tonics, with nourishing food and milk-punch. The patient was invariably in good spirits, expecting soon to be able to go home. Died, June 9th. *Autopsy* thirty-six hours after death: The left lung was infiltrated with tubercles, and had large cavities in its upper lobe; the superior lobe of the right lung also contained a very few tubercles. The mucous membrane of the intestines, especially of the ileum and cæcum, was inflamed; the solitary glands enlarged. The mesenteric glands were tubercular.

CASE 538.—Private John P. Phillips, company K, 42d Indiana volunteers; age 28; admitted from regimental hospital May 24, 1865. Chronic diarrhœa. The patient was much emaciated and greatly prostrated. Treatment: Astringents, camphor, opium and ipecacuanha. Died, June 12th. *Autopsy* twelve hours after death: The upper lobes of both lungs and the lower lobe of the left contained tubercular deposits, but there were no cavities. The liver was of a fawn-color. The mucous membrane of the intestines was inflamed. The mesenteric glands were enlarged.

CASE 539.—Private Nathaniel Sheppard, company C, 18th Wisconsin volunteers; age 28; admitted from regimental hospital May 9, 1865. Chronic diarrhœa. [This man appears on the register of the hospital of his regiment, near Raleigh, North Carolina, admitted April 16th—acute diarrhœa—sent to general hospital April 26th.] Was very much emaciated. Treatment: Astringents, Dover's powder, stimulants and suitable diet. The patient improved at first, but had a relapse June 6th, which resisted treatment. He became dispirited, stupid and lethargic. Died, June 13th. *Autopsy* six hours after death: The thoracic viscera were normal. The liver was much congested, the bile of a dark-red color. No intestinal ulceration was discovered.

CASE 540.—Private Lyman H. Cody, company A, 15th Michigan volunteers; age 30; admitted from Soldiers' Rest June 3, 1865. Chronic diarrhœa. The disease soon assumed a typhoid type. Treatment: Dover's powder, turpentine emulsion, camphor and opium, laudanum enemata, suppositories. Died, June 17th. *Autopsy* six hours after death: The upper lobe of the right lung was emphysematous. The pericardium contained five ounces of serum. The liver was enlarged, congested, and of a very dark color. The spleen enlarged and hard. The stomach empty. No ulceration was observed in the intestines.

CASE 541.—Private Michael Swift, company A, 17th Wisconsin volunteers; admitted July 22, 1865. He stated that he had suffered with diarrhœa over six months; is now emaciated to an extreme degree. To take camphor and opium pills; brandy. July 24th: Prescribed enemata of solution of chlorate of potassa. July 25th: The corneæ are becoming opaque. To rub the body with cod-liver oil. July 28th: The tongue is glazed, red, and has curdy flakes on its surface; but there has been less diarrhœa during the last forty-eight hours. July 29th: The tongue is less glazed, and the curdy flakes are less abundant. Last night the diarrhœa again became troublesome. To take pills of tannic acid and opium. July 30th: Vibices have made their appearance over the sternum; the hands and arms are cold; the stools are watery, frequent and involuntary. July 31st: The involuntary discharges continue; the patient is unable to swallow. Died, August 1st, at 3 A. M. *Autopsy* thirteen hours after death: Vibices on arms, legs and breast; slight rigor mortis in the upper extremities. The lungs were collapsed and pale; there were old pleuritic adhesions of the posterior and external portions of the right lung. The heart was normal, except that the foramen ovale was patulous. The lower part of the ileum was darkly injected, its mucous surface coated with whitish pseudomembrane. The colon was thickened, and there were a few ulcers in the caput coli and sigmoid flexure. The liver was normal. The spleen small, hard, its trabeculæ distinct. The kidneys large and fatty.—Acting Assistant Surgeon William C. Miner. [No. 596, Medical Section, Army Medical Museum, is from this case. The specimen is the heart, which is rather small; the foramen ovale is patulous, the opening passing obliquely through the interauricular opening; there is on each side of the passage a valve-like fold of the endocardium, by which the orifice was kept closed during life.]

CASE 542.—Private Curtis Cruiser, company K, 195th Ohio volunteers; age 19; admitted from his regiment October 10, 1865. Chronic dysentery. [This man appears on the hospital register of his regiment as under treatment for diarrhœa July 1st, August 19th, September 18th, and September 25th.] The evacuations being frequent, painful and scanty, camphor and opium pills were ordered, with a milk diet. October 13th: Had a chill last evening, followed by fever. To take five grains of quinine three times daily; laudanum enemata; brandy. October 14th: Is worse. To take an opium pill every four hours; brandy-punch every two hours. Died, October 15th. *Autopsy:* There were old pleuritic adhesions on both sides, but the lungs were healthy. The liver and spleen were normal. The colon was thickened, its mucous membrane coated with pseudomembrane.—Surgeon Edwin Bentley, U. S. V. [No. 636, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon thickened and presenting patches of pseudomembrane with many minute follicular ulcers.]

CASE 543.—Private Thomas Fitzgerald, company B, 1st Connecticut heavy artillery; age 30; admitted from regimental hospital September 27, 1865. Chronic diarrhœa. The patient was somewhat emaciated, and had been complaining about a month. He had daily from six to eight thin dark-brown stools, attended with much griping pain. To have half an ounce of castor oil with fifteen drops of laudanum at once, followed by five grains of Dover's powder every four hours. Diet: Milk-porridge, mutton-broth, boiled rice, toast and tea. October 1st: Is slightly improved; the stools are more consistent, and only from two to four daily. Continue treatment. October 15th: The stools are again thinner and more frequent. ℞. Subnitrate of bismuth, Dover's powder, of each one scruple; make four powders. Take one three times a day. October 20th: Is no better. Substitute pills of acetate of lead and opium. October 24th: Complains of severe pain in the abdomen. To take lime-water and milk during the day, and half a grain of sulphate of morphia at bed-time. October 27th: Still complains of some abdominal pain, but the stools are less frequent. To have fifteen drops of the tincture of chloride of iron three times daily. November 1st:

The stools are again more frequent, numbering six to eight daily; they contain mucus and blood. To have a laudanum enema after each stool. November 4th: Since the last report the stools have varied in number from two to four daily; they are dark and offensive. Continue the laudanum enemata, with the addition of a grain of nitrate of silver to each enema. November 6th: The stools continue as at last date, except that occasionally small masses of normal excrement are passed. Substitute injections of sulphate of zinc, one grain to the ounce of water, and give every six hours a pill containing one grain each of opium and ipecacuanha. November 10th: No improvement. The patient has become extremely emaciated; his hands and ankles are œdematous. Continue the pills; a laudanum enema after each stool. After this the patient grew rapidly worse, and died December 1st. *Autopsy:* Nothing abnormal was observed except in the colon, the mucous membrane of which was studded with follicular ulcers from the ileo-cæcal valve to the anus. The gall-bladder was moderately full of healthy looking bile.—Surgeon Edwin Bentley, U. S. V. [No. 673, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon, which is much thickened, and presents numerous follicular ulcers, with some adhering pseudomembrane. There are a number of stellate cicatrices between the ulcers.]

The next fifteen cases are from the case-book of the L'Ouverture Hospital, Alexandria, Virginia, Surgeon Edwin Bentley, U. S. V., in charge. All the patients were colored men, most of them sent to Alexandria from the hospital for colored troops, City Point, Virginia.

Case 544.—Private William Coleman, company E, 39th United States colored troops; age 24; admitted from regimental hospital June 17, 1864. Chronic diarrhœa and rheumatism. Died, July 13th. *Autopsy* eight hours after death: Body considerably emaciated. There was extensive inflammation of the mucous membrane of the whole intestinal canal, with considerable thickening of the cæcum, colon and rectum; no ulceration was observed. The other organs were healthy.

Case 545.—Private George Larue, company E, 31st United States colored troops; admitted from the field hospital August 9, 1864. Diarrhœa. Died, August 13th. *Autopsy* six hours after death: Body somewhat emaciated. There was some ulceration of the ileum, and general inflammation and thickening of the whole mucous membrane of the large intestine.

Case 546.—Private Joseph Bostwick, company C, 19th United States colored troops; age 56; admitted from the field August 9, 1864. Chronic diarrhœa [This man appears on the register of the hospital for colored troops, City Point, Virginia, admitted July 15th—remittent fever—sent to general hospital August 8th.] When first seen by the reporter, September 8th, he was extremely debilitated, but there was no diarrhœa, and no prominent symptoms of any kind. A nourishing diet was ordered. October 3d: Mild diarrhœa set in, which was readily checked by opium and tannic acid. The diarrhœa recurred October 9th, and resisted the anodynes and astringents which were employed. Died, October 12th. *Autopsy:* The whole intestinal canal was inflamed, but no ulceration was discovered. There was a small abscess in the left kidney. The other organs appeared to be normal.—Acting Assistant Surgeon E. P. Luce.

Case 547.—Private William Mason, company C, 28th United States colored troops; age 26; admitted from City Point October 31, 1864. Chronic diarrhœa of a typhoid type. [This man appears on the register of the hospital for colored troops, City Point, Virginia, admitted September 6th—diarrhœa—sent to general hospital October 30th.] Treatment: Astringents, anodynes and turpentine emulsion. Died, November 1st. *Autopsy:* The lower lobe of the left lung was congested. The intestines were highly congested, but not ulcerated. The kidneys much enlarged and granular.—Acting Assistant Surgeon Freeman Stoddard.

Case 548.—Private James Collins, company F, 43d United States colored troops; age 42; admitted from the hospital for colored troops, City Point, Virginia, October 31, 1864. Chronic diarrhœa. This man was brought to hospital in a very low condition. He was treated with astringents, anodynes, stimulants and beef-tea. Appeared to improve for about two days, but again became worse, and died November 4th. *Autopsy:* A large cavity was found at the apex of each lung. There were tubercles in the diaphragm, and very extensive inflammation of the whole intestinal canal.—Acting Assistant Surgeon Freeman Stoddard.

Case 549.—Private Joseph Allsop, company A, 30th United States colored troops; admitted from City Point, Virginia, October 31, 1864. Chronic dysentery. [This man appears on the register of the hospital for colored troops, City Point, Virginia, admitted October 3d—remittent fever—sent to general hospital October 30th.] Had been sick nearly three months. The discharges were bloody, and there was much abdominal pain. Died, November 4th. *Autopsy:* There was extensive ulceration of the large intestine, especially in the cæcum and rectum, where the ulcers were large and deep.—Acting Assistant Surgeon C. B. Bean.

Case 550.—Private Hiram Lamb, company D, 28th United States colored troops; age 55; native of North Carolina; three-quarters white; enlisted about January 1, 1864, but had been able to do but little duty, except as nurse at City Point hospital; admitted from the hospital for colored troops, City Point, Virginia, October 31, 1864, with chronic diarrhœa, from which he said he had suffered all summer. Treatment: Astringents, opiates, stimulants and light diet. He appeared to improve for a few days, but again declined, and died rather suddenly November 12th. *Autopsy:* The lungs were filled with tubercles, and in the apex of each were large cavities. The liver and spleen also contained tubercles. There were large and deep ulcers in the ileum, colon and rectum.—Acting Assistant Surgeon Freeman Stoddard.

Case 551.—Corporal Isaac F. Paul, company B, 27th United States colored troops; admitted November 17, 1864. Chronic diarrhœa, from which he stated he had suffered for three months. [This man appears on the register of the hospital for colored troops, City Point, Virginia, admitted August 20th—diarrhœa; no disposition.] He was much exhausted, greatly

emaciated, and had from eight to ten stools daily, with occasional vomiting. Treatment: Astringents and tonics, laudanum enemata, beef-tea, boiled milk and toast, milk-punch. Died, November 20th. *Autopsy:* The intestinal canal was extensively inflamed. Some ulcers were observed in the stomach. The spleen was extremely small, weighing only ten drachms and a half.—Acting Assistant Surgeon Frank Buckland.

CASE 552.—Private John Berry, company E, 29th United States colored troops; admitted November 17, 1864. Chronic diarrhœa. [This man appears on the register of the hospital for colored troops, City Point, Virginia, admitted September 6th—intermittent fever; no disposition.] Had been sick four months; was extremely weak and much emaciated. The stools averaged from eight to ten daily. To take pills of sulphate of copper, opium and tannic acid; enemata of castor oil and laudanum; boiled milk, toast and rice. He improved for a while, the stools being reduced in frequency to two or three daily, but speedily relapsed, and died November 25th. *Autopsy:* The ileum was inflamed; the cæcum, colon and rectum extensively ulcerated.—Acting Assistant Surgeon Frank Buckland.

CASE 553.—Private Solomon Dorsey, company B, 39th United States colored troops; admitted from the hospital for colored troops, City Point, Virginia, October 31, 1864. Ascites. Was first seen by the reporter November 19th. At that time he was very weak and much emaciated; had chronic diarrhœa, some cough, and was suffering from purulent otorrhœa in both ears. He was quite deaf, and complained of continual pain in the head. He seemed disinclined to answer questions. The cervical glands were enlarged. To take five grains of iodide of potassium three times daily; tincture of bark; nourishing diet; milk-punch; opiates at bed-time. Died, November 27th. *Autopsy:* Tubercular ulceration of both large and small intestine. The omentum was one mass of tubercle.—Acting Assistant Surgeon Frank Buckland.

CASE 554.—Private George Spriggs, company F, 19th United States colored troops; age 23; admitted November 17, 1864. Chronic diarrhœa. [This man appears on the register of the hospital for colored troops, City Point, Virginia, admitted September 13th—chronic diarrhœa—sent to general hospital November 16th.] He stated that he had been sick for a long time; was very feeble and much emaciated. Treatment: Astringents, tonics, anodynes, stimulants and light diet. He appeared to improve somewhat for a few days, but relapsed. Died, December 1st. *Autopsy:* The right pleural sac contained about two quarts of fluid, and there was also a considerable quantity in the abdominal cavity. The lymphatic glands at the root of the lungs were enlarged, and contained a hard deposit of tubercle. The entire omentum was one mass of tubercular deposit. The intestines were extensively inflamed, but there was no ulceration.—Acting Assistant Surgeon Freeman Stoddard.

CASE 555.—Private John Smith, company C, 29th United States colored troops; admitted from his regiment May 31, 1864. Inguinal hernia. When first seen by the reporter, September 9th, he was suffering from distressing dyspepsia, for which he was treated with gentian, quinia and other tonics, bismuth, stimulants, &c. Vomiting occurred constantly shortly after eating, even when the lightest diet was employed; nevertheless, his appetite seemed good. The pain after eating was so severe at times as to require anodynes. He had also occasional attacks of diarrhœa, lasting about a day, and ceasing spontaneously without the use of remedies. Between these attacks he was sometimes constipated, so as to require laxatives. At one time the abdominal pain was so severe that a blister was applied, with temporary relief. He finally refused medicine, and for more than a month took none except occasional anodynes when the pain was severe. December 7th: He was attacked with severe diarrhœa, the stools being cream-colored and yeasty in appearance. He failed rapidly, and died December 7th. *Autopsy* eighteen hours after death: Body much emaciated. The intestines were firmly adherent to each other and to the abdominal walls; they were extensively ulcerated. There was a double inguinal hernia.—Acting Assistant Surgeon E. P. Luce.

CASE 556.—Sergeant Elias H. Quillen, company C, 30th Connecticut volunteers, (colored:) admitted from the hospital for colored troops, City Point, Virginia, August 9, 1864. Chronic diarrhœa of about six months' duration; constant and annoying cough. The diarrhœa improved under treatment, but the pulmonary symptoms steadily progressed. He became extremely emaciated, and died December 11th. *Autopsy:* Tubercles in the right lung; a cavity at its apex. The stomach and entire intestinal canal were much inflamed, but there were no ulcers.—Acting Assistant Surgeon W. R. Fletcher.

CASE 557.—Recruit William Diller, (colored;) admitted from Lincoln hospital October 27, 1864. Gastrodynia. [This man appears on the register of the Augur hospital, near Alexandria, Virginia, admitted October 8th—remittent fever—sent to general hospital October 17th; and on the register of the Lincoln hospital, Washington, D. C., admitted October 18th—diarrhœa—sent to general hospital October 27th.] He complained of dyspeptic symptoms, especially of pain and swelling in the stomach; but his appetite was good, and he did not seem to be very sick. Occasionally he had slight attacks of diarrhœa, which were easily controlled by astringents, until about November 20th, when severe diarrhœa set in, which did not yield to treatment. There was some abdominal tenderness, but it was not thought that he was dangerously ill until a few hours before death. Died, December 15th. *Autopsy:* The ileum and large intestine were extensively ulcerated, and there were a number of perforations. [The record does not state whether in the small intestine or the large.] There was an extensive deposit of tubercle in the mesentery. The intestines were firmly adherent to each other and to the abdominal parietes.—Acting Assistant Surgeon Freeman Stoddard.

CASE 558.—Private William Wood, company D, 39th United States colored troops; age 37; admitted from City Point October 31, 1864. Diarrhœa and hemorrhoids. [This man appears on the register of the hospital for colored troops, City Point, Virginia, admitted September 6th—pneumonia—sent to general hospital October 30th.] Treatment: Astringents and anodynes. In a few days he ceased to be troubled with the hemorrhoids, but the diarrhœa, though relieved from time to time, frequently recurred. The patient grew gradually weaker, and became more and more emaciated. January 9, 1865: He complained in the morning of considerable pain in the limbs, but did not appear to be in a critical condition. He died about noon the same day. *Autopsy:* The pericardium contained some five or six ounces of bloody serum. The heart was quite flabby. The intestines were somewhat congested, but no ulcers were discovered.—Acting Assistant Surgeon Freeman Stoddard.

The next fourteen cases are from the case-book of the FAIRFAX SEMINARY HOSPITAL, near Alexandria, Virginia, Assistant Surgeon Harrison Allen, U. S. A., in charge:

CASE 559.—Private William Brophy, company D, 56th Massachusetts volunteers; age 46; admitted from the depot hospital of the 9th Corps, City Point, Virginia, July 24, 1864. Chronic diarrhœa. Died, July 26th, at 9.45 A. M. *Autopsy* seven hours after death: Body much emaciated. Near the ileo-cæcal valve were several ulcerations of Peyer's patches; one of them, about two inches from the valve, was two and a half inches long by one and a half broad, and penetrated to the peritoneum; the intestinal coats for ten inches below the ileo-cæcal valve were strongly injected, somewhat thickened, and presented several small ulcers; five inches below the valve one of the ulcers had perforated.

CASE 560.—Private Albert Smith, company D, 27th Michigan volunteers; age 19; admitted from the depot hospital of the 9th Corps, City Point, Virginia, July 24, 1864. Diarrhœa. Has from ten to fifteen passages daily; can retain nothing on his stomach; tongue furred and fissured, but moist. To take a camphor and opium pill every three hours. Tarragona wine; milk diet. July 25th: Abdomen tender on pressure; stools fluid and clay-colored. Continue treatment, and add two grains and a half of subnitrate of bismuth every four hours. July 26th: Is somewhat better; seems more cheerful, and has a little appetite. July 27th: Continues to improve; is able to sit in a chair outside of the ward. July 29th: Got up to stool, fell down suddenly, and expired in a few minutes. *Autopsy:* The ileum was inflamed throughout, but no ulcers were found. The spleen was very soft and dark, five and a half inches long by three and a half broad; the kidneys somewhat congested. All the other viscera normal.—Acting Assistant Surgeon Edward David.

CASE 561.—Musician Thomas Barney, 2d Pennsylvania heavy artillery; age 41; admitted from the depot hospital of the 9th Corps, City Point, Virginia, July 25, 1864. Chronic diarrhœa. The patient was in an extremely exhausted condition when admitted, and died July 30th. *Autopsy* three hours after death: The thoracic viscera were healthy. The mucous membrane of the lower part of the ileum was inflamed and presented several ulcers just above the ileo-cæcal valve. The large intestine was extensively ulcerated, and two of the ulcers in the descending colon had perforated.—Assistant Surgeon Harrison Allen, U. S. A. [Nos. 329 to 331, Medical Section, Army Medical Museum, are from this case. No. 329 is a portion of the ileum taken from just above the ileo-cæcal valve, presenting a few small superficial ulcers. No. 330 is a portion of the transverse colon of the same patient, presenting several ulcers which penetrate to the muscular coat. No. 331 is a portion of the descending colon, presenting several ulcers, two of which have perforated.]

CASE 562.—Private William Farley, company E, 31st Maine volunteers; age 31; admitted from the depot hospital of the 9th Corps, City Point, Virginia, July 24, 1864. Had been attacked by acute rheumatism while before Petersburg about ten days previously. He was much debilitated; the joints of the lower extremities were swollen and tender; the bowels constipated. To take a dose of castor oil; chicken diet. July 26th: He was attacked with acute dysentery. Treatment: Paregoric; boiled milk diet. July 27th: Ordered powders of camphor, opium and ipecacuanha. July 28th: Added six ounces of brandy daily. August 2d: Substituted six ounces of Tarragona wine daily. He ran down rapidly, became comatose, and died August 6th, at 1.55 A. M. *Autopsy* next day: Body much emaciated. Larynx, lungs and heart healthy. Both large and small intestine were inflamed throughout, especially from the middle of the ileum downward; but no marked ulceration was observed. There was an intussusception twelve or fourteen inches from the ileo-cæcal valve and about twelve inches in extent; it was not accompanied by adhesions or other evidences of local peritonitis. Liver normal. Spleen six inches and a half long by four wide. Kidneys large and congested.—Acting Assistant Surgeon John H. Pierce.

CASE 563.—Private Joseph Faith, company I, 14th New York artillery; admitted from the field July 24, 1864. Chronic diarrhœa. [This man appears on the hospital register of his regiment, admitted June 27th—dysentery—returned to duty June 29th; admitted July 4th—diarrhœa—returned to duty July 5th; admitted July 7th—returned to duty July 8th; and finally sent to division hospital July 12th—diarrhœa and piles. He is borne on the register of the field hospital of the 1st Division, 9th Corps, admitted July 12th—hemorrhoids—sent to depot hospital July 17th. He appears on the register of the depot hospital of the 9th Corps, admitted July 17th—no diagnosis—sent to general hospital July 22d.] When admitted he was in a dying condition. Surface cold and clammy; pulse scarcely perceptible; tongue dry and cracked; great thirst; severe abdominal tenderness; frequent liquid dirty-yellow stools, containing no blood or mucus. Directed boiled milk and port-wine. August 3d: Chicken diet. Died, August 6th, at 12.45 P. M. *Autopsy* twenty-four hours after death: Larynx healthy. Pleuritic adhesions on the right side, and two ounces of fluid in the pleural sac. Left lung, heart and liver healthy. Spleen very firm, six inches long by four broad. Peyer's patches were somewhat inflamed, and the cæcum was slightly ulcerated.—Acting Assistant Surgeon Joseph H. Robinson.

CASE 564.—Private Foster R. Soper, company H, 37th Wisconsin volunteers; admitted from the depot hospital of the 9th Corps, City Point, Virginia, July 24, 1864. Chronic rheumatism. He is very much emaciated; complains of pains all over his body; is very weak and nervous; pulse 100; says he had previously suffered from rheumatism; bowels loose. To take pills of camphor and opium; a teaspoonful of solution of morphia at bed-time; Tarragona wine July 26th: Had several green watery stools last night; complains of epigastric pains; the abdomen is tumid and tender. Continue treatment, adding stimulants and beef-tea. August 4th: Very restless last night; frequent vomiting of a dark-green fluid. To take three grains of the subnitrate of bismuth every four hours; injections of beef-tea. August 6th: Tongue dry and furred; is very weak and delirious; diarrhœa continues. To take tincture of catechu and laudanum; brandy. August 8th: Great stupor. Died at 6.30 P. M. *Autopsy* nineteen hours after death: Larnyx, lungs and heart healthy. Liver fatty; gall-bladder full. Spleen firm, four inches and a half long by three inches broad. Stomach somewhat inflamed, half full of dark-green bilious fluid. Colon much inflamed. Solitary follicles enlarged and ulcerated. Mesenteric glands normal.—Acting Assistant Surgeon Edward David.

CASE 565.—Private James Roberts, company L, 24th New York cavalry; admitted from the depot hospital of the 9th Corps, City Point, Virginia, July 24, 1864. Diarrhœa. He was much emaciated and extremely jaundiced. Died, August 25th, at 1 P. M. *Autopsy* five hours after death: Slight rigor mortis; body extremely emaciated. Lungs and heart healthy. The liver measured ten inches by seven and a half; it was of a dark brownish-red color and very firm, the acini distinct; the gall-bladder contained six ounces of a dark grumous viscid liquid. The spleen measured six by four inches, was very firm, dark beef-red in color. The small intestine was healthy. The large intestine was extensively ulcerated.

CASE 566.—Private Edward Colcord, 2d Battalion Veteran Reserve Corps; age 60; admitted August 20, 1864. This man, who was one of the hospital guard, came to surgeon's call on the morning of August 6th, complaining of diarrhœa, from which he said he had suffered more or less for six months. He was evidently debilitated; his complexion sallow and pale; tongue furred; pulse quick and small; skin hot and dry. He had thirst and anorexia; foul breath; slight nausea and eructations; flatulence; griping pains and tenesmus. The stools were from ten to fifteen daily, and consisted chiefly of thin frothy mucus mixed with blood. He was treated in quarters till August 20th, receiving at first a dose of castor oil and laudanum, followed, August 7th, by the following: ℞. Sulphate of quinia twelve grains, opium three grains, ipecacuanha one grain, blue pill six grains; make six pills. Take one every four hours. August 10th, the following was substituted: ℞. Tincture of catechu and wine of ipecacuanha of each half an ounce, tincture of opium two drachms. Take twenty-five drops every three hours. August 20th: He was so weak that he was admitted to hospital, and the following was prescribed: ℞. Tannic acid one scruple, sulphate of morphia one grain; make six pills. Take one every four hours. A tablespoonful of brandy every half hour. August 24th: Is very much prostrated; the evacuations are frequent and distressing. Substituted pills containing quinine, sulphate of copper and morphia for the former treatment. Continue the brandy. August 25th: The stools are passed involuntarily. Died, August 26th, at 7 A. M. *Autopsy* ten hours after death: The body was not much emaciated. The lungs were collapsed, dry, and contained much pigment. The heart was normal; its right ventricle contained a firm black clot of moderate size. The liver showed some tendency to cirrhosis at its anterior border; the gall-bladder was distended with thick greenish glairy bile. The spleen was of moderate size and very firm. The mucous membrane of the small intestine was pale; Peyer's patches were inconspicuous, and there was no ulceration. The mucous membrane of the large intestine was extensively coated with pseudomembrane, which in places was stained by the intestinal contents, giving it a blackish color. The pseudomembrane had separated in many places, leaving large ulcers from the edges of which the membrane hung in shreds. The kidneys were fatty and softer than normal; in the inferior part of the external surface of the right kidney there was a cyst of moderate size. The suprarenal capsules were friable and nodulated externally.—Assistant Surgeon Harrison Allen, U. S. A. [Nos. 383 and 384, Medical Section, Army Medical Museum, are from this case. No. 383 is a portion of the ascending, No. 384 of the transverse, colon; the mucous membrane of both is thickened, and presents a number of large deep ulcers which occupy a large portion of the surface; shreds of undermined mucous membrane hang from the edges of the ulcers.]

CASE 567.—Private Merritt D. Griswold, company F, 17th Vermont volunteers; admitted from Augur hospital, Alexandria, Virginia, August 11, 1864. Chronic diarrhœa. [This man appears on the register of Augur hospital, admitted August 8th—chronic diarrhœa—sent to general hospital August 11th.] Died, September 3d, at 2.10 P. M. *Autopsy* twenty-three hours after death: Pneumonia of both lungs, most marked at the apex of the right lung. Heart healthy. Liver fatty; gall-bladder distended. The spleen measured six inches by four; it was of natural consistence and dark-red color. There was marked ulceration in the ileum for six inches above the ileo-cæcal valve; the rest of the small intestine was healthy. The large intestine was not inflamed or ulcerated. Kidneys and suprarenal capsules healthy.—Acting Assistant Surgeon John H. Pierce.

CASE 568.—Private Owen Warren, company I, 45th Pennsylvania volunteers; admitted July 24, 1864. Chronic rheumatism. [This man appears on the register of the hospital of the 2d Division, 9th Corps, admitted July 9th—diarrhœa—sent to depot hospital July 15th. He is borne on the register of the depot hospital of the 9th Corps, admitted July 15th—sick—sent to general hospital July 22d.] Complained of pain in the back and extremities; appetite good; bowels regular, but had severe diarrhœa recently. August 5th: The diarrhœa recurred, and he continued to have two or three stools daily during the month; subsequently the stools became more frequent and profuse, and a severe cough set in, accompanied by much pain in the chest and profuse but easy expectoration. Treatment: Tonics, astringents, milk diet. Died, September 16th. *Autopsy* five hours after death: Body very much emaciated. The right lung contained some tubercles in its posterior portion, but was healthy anteriorly; there were firm pleuritic adhesions on the left side, and some tubercles in the apex of the left lung, but not so many as in the right. Heart large, pale and flabby; contained firm clots. Liver fatty; gall-bladder distended. The spleen measured five inches by three, was dark in color and very firm. The small intestine was healthy to within a foot of the ileo-cæcal valve, thence much inflamed. The large intestine was extensively ulcerated, some of the ulcers nearly perforated. Kidneys and suprarenal capsules healthy.—Acting Assistant Surgeon Joseph H. Robinson.

CASE 569.—Private Rennselaer Bailey, company G, 24th New York cavalry; admitted from the depot hospital of the 9th Corps, City Point, Virginia, July 24, 1864. Chronic diarrhœa. This patient had suffered from diarrhœa five or six weeks; was somewhat emaciated; had but little appetite; tongue coated with a white fur. About two weeks after admission he had an attack of paraplegia, which, after several days, confined itself to the right lower extremity. August 14th: He commenced to sit up and walk about, his gait at first resembling that of a drunken man. Died, September 16th, at 7 P. M., of chronic diarrhœa. *Autopsy* fifteen hours after death: Body much emaciated. Intestines inflamed throughout; slight ulceration above the ileo-cæcal valve. Spleen four inches by four. Other organs healthy.

CASE 570.—Private Landon Cram, company A, 10th Vermont volunteers; age 43; admitted October 10, 1863. Chronic diarrhœa of two months' duration, with eight to twelve stools daily. The patient was of small frame, feeble and much emaciated. To take quarter of a grain of nitrate of silver with half a grain of opium and one of quinine every three hours. Apply a sinapism to the stomach. Wine, eggs and milk diet. October 14th: Diarrhœa somewhat better. October 15th: Complains of sore throat. No ulceration or pseudomembrane could be detected on examination, but diphtheria was suspected. ℞. Tincture

of chloride of iron two drachms, sulphate of quinia twenty-four grains, sherry wine six ounces. Take a tablespoonful every three hours. The throat was mopped with a strong solution of nitrate of silver, and a gargle containing chlorate of potash and nitrate of silver was directed. Diet: Milk and eggs. October 16th: Great irritability of the stomach and some difficulty in swallowing. ℞. Creasote one drop, water four ounces. To take a tablespoonful every fifteen minutes. Milk-punch. October 18th: No better. Throat very much inflamed, stomach still irritable. ℞. Chloroform, oil of turpentine, olive oil, equal parts. Apply to the throat externally. Continue the prescription of October 15th. Apply a sinapism to the abdomen. The gastric irritability persisting, the following was prescribed: ℞. Chloroform two drachms, simple syrup five ounces. To take a teaspoonful every three hours. Died at 10 P. M. *Autopsy* sixteen hours after death: An examination of the throat disclosed well-marked diphtheria. There were pleuritic adhesions on the right side, and the lower lobe of the left lung was partly hepatized; in the superior lobe of the right lung were two abscesses, one as large as a filbert. [The condition of the intestinal canal was not recorded.]—Acting Assistant Surgeon John E. Smith.

CASE 571.—Private Andrew Miller, company D, 64th New York volunteers; admitted November 2, 1864. Chronic diarrhœa. [This man appears on the register of the hospital of the 1st Division, 2d Corps, admitted September 13th—fever—returned to duty September 25th; again admitted October 26th—pain in the heart—sent to depot hospital the same day. He is borne on the register of the depot hospital of the 2d Corps, City Point, Virginia, admitted October 26th—dyspepsia; no disposition recorded.] The patient was very much emaciated and so weak that he staggered in walking; skin muddy and covered with a bran-like desquamation; tongue flabby; sordes on teeth; marked abdominal tenderness, especially in the umbilical region; the evacuations were very frequent, sometimes bloody. To take a tablespoonful of Hope's camphor mixture every two hours, and a teaspoonful of solution of morphia at bed-time. The surface to be sponged. Beef-tea and boiled milk. November 3d: Evacuations very frequent, copious, watery and offensive; with one of the evacuations a large clot of blood was passed; some strangury and pain over the bladder; urine scanty and high colored. Continue treatment. Administered an enema of laudanum and starch-water twice during the day. Applied cloths wrung out of hot water to the hypogastric region. Five ounces of brandy. November 4th: Evacuations still from twelve to fifteen in the twenty-four hours; blood passed occasionally; urine passed freely and without pain. Substituted for Hope's mixture another containing creasote, catechu and laudanum. Brandy and tincture of cinchona every two hours. Died, November 6th, at 1 P. M. Mind clear throughout the case. *Autopsy* twenty-four hours after death: Body emaciated; abdomen distended. The whole length of the large intestine was extensively ulcerated, some of the ulcers almost perforating; the intestine was tender and readily broken. The other organs appeared healthy.—Acting Assistant Surgeon Chas. A. Rahter.

CASE 572.—Sergeant Abraham L. Vanderlin, company I, 124th New York volunteers; admitted from City Point, Virginia, November 2, 1864. Diarrhœa. [The register of the hospital of his regiment shows that this man was under treatment for bronchitis in March, 1864, and for diarrhœa in July and August. He appears upon the register of the depot hospital of the 2d Corps, City Point, Virginia, admitted August 11th—diarrhœa—transferred August 31st. He is borne upon the register of the field hospital of the 3d Division, 2d Corps, admitted September 8th—diarrhœa—sent to depot hospital October 19th. He again appears upon the register of the depot hospital of the 2d Corps, admitted October 19th—diarrhœa—sent to general hospital.] Died, November 7th, at 6.30 P. M. *Autopsy* nineteen hours after death: Body greatly emaciated. The heart was small and contained no clots. The pericardium contained about four ounces of fluid. Lungs normal. The liver measured eight inches by ten; the gall-bladder was contracted and nearly empty. The spleen measured five inches by three, was dark brown in color, and very firm. The pancreas was normal. The stomach was injected with blood, mainly in the larger curvature. The small intestine was slightly inflamed throughout; a few of the solitary glands were enlarged to the size of small peas, and had little ulcers at their apices. The large intestine was ulcerated throughout, especially in the rectum.

Specimens from three fatal cases of chronic diarrhœa were forwarded to the Museum from the army of the Potomac, during the summer of 1863, by Surgeon Edward L. Welling, 11th New Jersey volunteers. The names of the soldiers were not given, nor was any history of the cases furnished:

CASE 573.—Nos. 178 and 179, Medical Section, Army Medical Museum, are from a patient who died of chronic diarrhœa during the spring of 1863 in the field hospital at Windmill Point, Virginia. No. 178 is a portion of the sigmoid flexure; No. 179 is a portion of the rectum. In both specimens the mucous membrane is thickened, softened, and presents numerous ulcers which have evidently originated in the solitary follicles; the mucous surface between the ulcers is slightly coated with pseudomembrane.

CASE 574.—No. 285, Medical Section, Army Medical Museum, is a portion of the colon, the mucous membrane of which is greatly thickened and presents numerous irregular ulcers. From a patient who died of chronic diarrhœa in field hospital, army of the Potomac, in the summer of 1863.

CASE 575.—Nos. 286 and 287, Medical Section, Army Medical Museum, are from a patient who died of chronic diarrhœa in field hospital, army of the Potomac. The specimens are two successive portions of the colon, in which the mucous membrane is greatly thickened and presents numerous follicular ulcerations.

The next six cases are from the case-book of the DEPOT HOSPITAL OF THE FIFTH ARMY CORPS, City Point, Virginia, Surgeon W. L. Faxon, 32d Massachusetts volunteers, in charge:

CASE 576.—Corporal Francis A. Crane, company C, 16th Maine volunteers; admitted from the field hospital of the 3d Division, 5th Corps, January 2, 1865. Chronic diarrhœa. Died, January 13th. *Autopsy:* The lungs and heart were healthy.

The stomach was thin and pale. The spleen was natural in size, but rather hard. The liver and kidneys were healthy. The mucous membrane of the ileum was somewhat thickened. The large intestine very much thickened, and presented numerous ulcers in all parts from one extremity to the other; many of the ulcers penetrated to the muscular coat.

CASE 577.—Private Charles Later, company G, 198th Pennsylvania volunteers; admitted from the field hospital of the 1st Division, 5th Corps, January 3, 1865. Diarrhœa. Died, January 23d. *Autopsy:* There were pleuritic adhesions on the right side, some fluid in the right pleural cavity, and an abscess in the right lung; the left lung was the seat of a deposit of tubercles. The pericardium contained a quantity of serum. The liver weighed eighty-two ounces. The spleen weighed eight ounces. The mucous membrane of the large intestine was ulcerated throughout its entire length; the ascending and transverse colon distended with gas. The mucous membrane of the small intestine was softened but not ulcerated.—Assistant Surgeon G. H. Rugg.

CASE 578.—Sergeant Amos Swasey, 107th Pennsylvania volunteers; age 32; admitted from division hospital at the front January 17, 1865. Chronic dysentery. The patient was in a state of collapse; his face pale and cold; pulse thread-like; tongue pale but not coated. He stated that he had suffered with looseness of the bowels for some time, and that about ten days ago he had passed suddenly a pint or more of blood; since then had bloody and muco-purulent stools at short intervals. On the right side the superficial veins of his abdomen and thorax were very much enlarged. During the seven days he survived there was but little change in his condition. His tongue continued clean to the last; his intellect was undisturbed; pulse 120 to 130 and thread-like; surface pale and cold, at times covered with a clammy sweat. The decubitus was on the right side, with the feet drawn up and head elevated; occasionally there was an expression of pain about his mouth, but he only admitted that he felt pain when he was moved. The evacuations from the bowels were small, frequent, dark colored, grumous, and had a fetid smell. They were checked by injections during the first three days, which afterward were of no avail. On the evenings of the 19th and 20th he became very faint and almost pulseless, but did not die until the 24th. The treatment was sustaining and stimulant throughout. *Autopsy:* Height five feet ten inches. Both lungs were completely adherent to the thoracic parietes, and had deposits of tubercle in their apices; the right lung weighed sixteen ounces, the left seventeen. The heart was healthy; it weighed seven ounces; its right auricle was filled with coagulated blood; the other cavities were empty. The mucous membrane of the stomach presented a number of minute ulcers. There were a few small ulcers about the middle of the jejunum, and some slight thickening of Peyer's patches. The colon was thickened and ulcerated. The liver weighed eighty-seven ounces; it had a large abscess on its under surface containing about a quart of pus; the apex of the abscess rested against the vena cava; the gall-bladder was full. The spleen was firm and pale; it weighed five ounces. The kidneys were pale; the right weighed four ounces, the left five.—Assistant Surgeon Granville M. Baker. [No. 478, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the greater curvature of the stomach, which presents a number of minute ulcers.]

CASE 579.—Private Andrew Musgrave, company B, 8th Maryland volunteers; admitted from the field January 30, 1865. Acute dysentery. Died, February 2d. *Autopsy:* Height five feet six inches. The right lung was healthy and weighed twelve ounces; its upper lobe was adherent to the thoracic parietes; the left lung was healthy and weighed fifteen ounces. The heart weighed ten ounces. The liver was pale and weighed fifty-seven ounces. The spleen was pale and soft, weight four ounces. The kidneys were pale; the right weighed four ounces, the left three ounces. The stomach was pale but apparently healthy. The ileum was injected and thickened for three feet from the ileo-cæcal valve. The colon was much thickened and ulcerated throughout its entire length; the edges of the ulcers were fringed with pseudomembrane. The mucous membrane of the rectum protruded through the anus about half an inch.—Assistant Surgeon G. H. Rugg.

CASE 580.—Private David C. Hollenbeck, company E, 188th New York volunteers; age 37; admitted from the field hospital of the 1st Division, 5th Corps, January 30, 1865. Chronic diarrhœa. Died, February 5th. *Autopsy:* The lower lobe of each lung was congested; the right lung weighed twenty-two ounces, the left fourteen ounces. The heart weighed nine ounces. The liver weighed fifty-two ounces; the spleen four ounces; the right kidney five ounces, the left four ounces. The mesenteric glands were enlarged and congested. The stomach was congested and contracted. The duodenum and jejunum were healthy, except that there was an intussusception two inches long about seven feet and a half from the stomach. There was a good deal of ulceration in the neighborhood of the ileo-cæcal valve, and a few ulcers scattered through the colon.—Assistant Surgeon Mathias L. Lord.

CASE 581.—Private George McCowen, company C, 107th Pennsylvania volunteers; admitted from the field hospital of the 3d Division, 5th Corps, February 2, 1865. Hepatitis. Returned to duty February 21st. Readmitted March 17th. Diarrhœa. Died, March 27th. *Autopsy:* There were no adhesions between the lungs and the thoracic parietes, but some slight ones between the several lobes of both lungs, and small spots of inflammation scattered through the parenchyma of both; the right lung weighed eighteen ounces, the left twenty ounces. The heart weighed ten ounces. The liver was granular and very soft; it weighed forty-two ounces. The spleen weighed seven ounces. The stomach, duodenum and jejunum were healthy. The ileum was congested in spots, but there were no ulcers. The colon was thickened and softened. The left kidney weighed nine ounces, the right eight ounces.

The next three cases are from the case-book of the DEPOT HOSPITAL OF THE SIXTH ARMY CORPS, City Point, Virginia, Assistant Surgeon J. Sykes Ely, U. S. V., in charge:

CASE 582.—Private George Bevins, company D, 77th New York volunteers; admitted from the field hospital of the 2d Division, 6th Corps, City Point, Virginia, March 15, 1865. Chronic diarrhœa. Died, March 15th. *Autopsy* forty-eight hours after death: Rigor mortis not well marked. Both lungs were distended with frothy serum. There were no pleuritic adhesions on either side. The left pleural sac contained about six ounces of bloody serum. The heart was large and filled with mixed

clots. The liver was congested and quite large, extending entirely across the abdomen; the gall-bladder was about two-thirds full of bile. The kidneys were large and congested. The omentum was contracted and thin. The transverse colon was distended with gas. No intestinal ulceration was detected. The mesenteric glands were enlarged.

Case 583.—Private John Kauffman, company A, 61st Pennsylvania volunteers; admitted from the field hospital of the 2d Division, 6th Corps, April 21, 1865. Chronic diarrhœa. Died, April 30th. *Autopsy* twenty-two hours after death: No rigor mortis. There were slight pleuritic adhesions on the right side. The right lung was normal; the left lung was in the first stage of pneumonia. The heart, liver, spleen and stomach were normal. The mucous membrane of the intestines was congested but not ulcerated.

Case 584.—Private Henry Mentor, company H, 1st Connecticut cavalry; admitted from Cavalry Corps hospital May 8, 1865. Diarrhœa. Died, May 13th. *Autopsy* sixty hours after death: Rigor mortis well marked. The lungs were congested and bound by firm adhesions to the thoracic parietes. The heart and liver were normal. The gall-bladder was distended with bile. The spleen and stomach were normal. No evidences of disease were recognized in the intestinal canal; and, in fact, nothing was discovered during the autopsy which could satisfactorily account for the fatal result.

Of the next two cases, the first is from the case-book of Hospital No. 1, Beaufort, South Carolina, the second from a medical descriptive list; Surgeon Reed B. Bontecou, U. S. V., in charge at the date of the first case; Surgeon John Trenor, jr., U. S. V., at the date of the second:

Case 585.—Private Sylvanus Bragdon, company K, 8th Maine volunteers; age 19; admitted September 22, 1862. Jaundice. Ordered a purgative dose of fluid extract of taraxacum, and the following day three grains of citrate of iron and quinine every three hours. September 24th: Ten grains of blue mass followed by castor oil. The patient was first seen by the reporter October 3d. He was still jaundiced and debilitated. The citrate of iron and quinia was continued. October 15th: Some dropsical effusion was noticed in the abdomen, and pain in the left hypochondrium was complained of. Ordered four grains of iodide of potassium every eight hours; a Dover's powder at night. October 20th: Complained of a troublesome cough, with some expectoration. A simple expectorant mixture was prescribed. October 25th: Cough is still troublesome, the expectoration purulent. Cod-liver oil was ordered, and the other medicines discontinued. October 27th: Diarrhœa having been induced by the cod-liver oil, it was discontinued. October 29th: Pleurisy has set in on the right side. A blister was applied to the lower part of the chest, and a quarter of a grain each of calomel, opium and ipecacuanha ordered to be given every five hours. Died, November 5th. *Autopsy* twelve hours after death: The right pleural sac contained a large amount of serum, and was lined by a layer of plastic lymph; the right lung was healthy; the left pleural sac was obliterated by ancient adhesions, and the apex of the left lung was solidified with tubercles, some of which had broken down, forming cavities the size of white beans. The heart and pericardium were normal. The abdomen contained about three pints of serum. The peritoneum was everywhere thickened, and all the abdominal organs were agglutinated together by thick recent lymph. The liver was large, and of a greenish-bronze color both externally and internally; the gall-bladder was filled with thin pale bile. The spleen was one-fifth larger than natural. The mucous membrane of the sigmoid flexure and transverse colon was livid, and presented traces of former ulcers. The large intestine was contracted to the size of an ordinary small intestine.—Surgeon Reed B. Bontecou, U. S. V.

Case 586.—Private Lucius H. Jagger, 1st Connecticut light battery; age 22; admitted from hospital No. 2, May 17, 1864. Dyspepsia and diarrhœa. [This man appears on the register of hospital No. 2, Beaufort, South Carolina, admitted April 3, 1864; no disposition.] The patient was transferred to this hospital from hospital No. 2, where he had been under treatment since April 3d. He had received an injury from the limber of a gun, since which he had suffered from pain in the epigastric and left hypochondriac regions, distress, a fainting sensation, nausea and vomiting on taking food. Digestion and nutrition were very much impaired. His stomach retained nothing but farina, diluted boiled milk and soft boiled eggs, egg-nog and milk-punch. He was unable to retain beef-essence or solid food of any kind. Whatever his stomach did retain caused nausea, and frequently also vomiting. His bowels were sometimes loose, and then again constipated, irrespective of diet or treatment. Bismuth, nitrate of silver, and the bitter tonics were employed in the treatment, with magnesia to correct acidity, opiates and hyoscyamus to relieve pain, and counter-irritation to the epigastrium. At times, for a period of several weeks, no medicine was given, and the diet very carefully regulated. His condition was about the same with or without medical treatment. The diarrhœa gradually grew worse, and he died July 17th. [There is no record of the autopsy.]—Acting Assistant Surgeon Charles T. Reber. [No. 333, Medical Section, Army Medical Museum, is from this case. The specimen is the stomach, which is thickened, its rugæ conspicuous, and the mucous surface thinly coated with pseudomembrane.]

The notes of the next two cases were forwarded, with the specimens, from Hospital No. 3, Beaufort, South Carolina, Assistant Surgeon F. Townshend Dade, U. S. V., in charge:

Case 587.—Private Alonzo Hause, company G, 8th Maine volunteers; admitted November 16, 1862. Chronic diarrhœa. He was very much emaciated, and had been suffering with diarrhœa about two months. He had frequent and copious evacuations, but without fever or tenesmus. The skin was dry, the urine scanty and high colored. He complained of pain in micturition, and also of pain along the whole track of the colon; he had some little nausea, and complained of a sinking sensation in the abdomen. He was given a hot bath at first, and rubbed well with coarse towels; a blister was then applied over the track of the colon. Injections of starch-water and laudanum were used three times daily, and he took every three hours a pill containing

half a grain of opium, three grains of camphor, and two of sulphate of quinia. Egg-nog was given freely, and as diet he had eggs, boiled meat, beef-tea, &c. Upon this treatment he improved rapidly for several days. His stools became less frequent, the pain disappeared, and it was thought he would soon recover. Instead, however, he became suddenly worse, had more pain, more frequent stools, and passed a great deal of mucus with them. Injections of nitrate of silver, ten grains to the ounce of water, with a little laudanum, were then resorted to with temporary relief; but the patient again became worse, and died December 4th. *Autopsy:* The colon and rectum were extensively ulcerated, and a quantity of coagulated lymph was deposited upon the ulcerated surface. The other organs were healthy.—Assistant Surgeon F. Townshend Dade, U. S. A. [Nos. 71 to 74, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the colon, which is much thickened; the mucous membrane irregularly eroded, leaving innumerable little islets intact, so that the whole has a granulated appearance. There is an irregular deposit of pseudomembrane on the ulcerated surface.]

CASE 588.—Corporal Isaac Wike, company F, 55th Pennsylvania volunteers; admitted December 9, 1862. Chronic diarrhœa. [This man appears on the register of the hospital of his regiment, admitted September 5th—remittent fever—sent to general hospital September 12th. He is borne on the register of hospital No. 2, Beaufort, South Carolina, admitted September 12th—dysentery—returned to duty October 23d. He again appears on the register of his regiment, admitted October 30th—debility—returned to duty November 1st; and again taken sick December 9th—dysentery—sent to general hospital the same day.] Died, December 25th. *Autopsy:* The colon and rectum were extensively ulcerated. The two kidneys were fused together at their inferior extremities by an isthmus about an inch and a half across; each kidney has its ureter and bloodvessels complete.—Assistant Surgeon F. Townshend Dade, U. S. V. [No. 23, Medical Section, Army Medical Museum, is from this case. The specimen is the double kidney above described.]

The following case was forwarded on a medical descriptive list from HOSPITAL No. 6, Beaufort, South Carolina, Assistant Surgeon Edwin D. Buckman, U. S. V., in charge:

CASE 589.—Private John T. Murray, company C, 29th Connecticut (colored) volunteers; age 45; admitted from regimental hospital April 30, 1864. Chronic dysentery. The regimental surgeon stated that this patient had been sick for several weeks. He has now frequent desire to go to stool, severe pain and tenesmus. The stools are fetid, dark colored, and mixed with shreds of lymph. There is fever and great constitutional disturbance. The tongue is furred; the pulse quick and small. There is anorexia and great prostration. To take powdered opium half a grain, acetate of lead one grain, every four hours. Stimulants, farinaceous diet and milk. May 1st: No improvement. Treatment continued, with opiate enemata. May 2d: Pulse weaker; tongue dry and red; bilious vomiting in the evening. Treatment continued. May 3d: To take powdered opium one grain, and blue pill two grains, every four hours. May 4th: No improvement. Treatment continued. May 5th: Frequent hæmorrhage from the bowels; the patient is much prostrated. To take twenty drops of oil of turpentine every six hours; whiskey and quinine. May 6th: Hiccough has set in; is greatly exhausted; abdomen tense, full and tender on pressure. Treatment continued. Died, May 7th. *Autopsy:* The large intestine was extensively ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. M. Matlack.

The next three cases are from CAMP DENNISON HOSPITAL, near Cincinnati, Ohio. The first two were forwarded on descriptive lists, Surgeon B. Cloak, U. S. V., in charge; the last is from the case-book of the hospital, Surgeon C. McDermont, U. S. V., in charge:

CASE 590.—Private William G. Hillman, company A, 2d Ohio heavy artillery; age 21; admitted August 17, 1863. Acute dysentery. The patient was much prostrated and had about forty bloody stools in the twenty-four hours. There was a great deal of tormina and tenesmus; the tongue was red; the pulse quick and feeble. ℞. Sulphate of magnesia two ounces, powdered opium two grains. Take at one dose. Cups to the abdomen. August 20th: Stools not so frequent, but still bloody and accompanied by a great deal of pain. Gave a dose of castor oil and laudanum. August 25th: Tongue red, fissured and dry; but little appetite. ℞. Acetate of lead one scruple, powdered opium ten grains, powdered ipecacuanha five grains; make twelve powders. Take one every three or four hours. Injections of laudanum and starch-water. August 31st: Discharges not so bloody and less frequent; appetite improving. Treatment continued. September 1st: Had four passages from the bowels in the last twenty-four hours; no blood. ℞. Nitrate of silver three grains, sulphate of morphia two grains, wine of ipecacuanha one drachm, camphor water one ounce. Take a teaspoonful every two hours. September 3d: The patient has taken cold and the glands of his neck are enlarged. Treatment continued. Apply tincture of iodine to the neck. September 4th: Has more fever, some cough, and considerable dyspnœa. Complains of pain in the chest and abdomen; pulse frequent and thread-like; tongue and lips very dry; sordes on the teeth. Take ten grains of Dover's powder at bed-time; counter-irritation over the chest and abdomen. September 7th: The patient is delirious at times and is gradually growing worse. His breathing is constrained, short and accelerated; the sputa have acquired considerable viscidity. There is dulness on percussion and bronchial respiration on both sides. The patient lies on his back. His delirium takes the form of dread lest he should be captured by the enemy. (He is a refugee from Virginia.) ℞. Sulphate of quinia twenty grains, opium three grains, ipecacuanha five grains; make twelve powders. Take one every four hours; also a teaspoonful of turpentine emulsion every four hours, and free stimulation. Died, September 13th. *Autopsy:* A considerable portion of both lungs was hepatized. The mesenteric glands were enlarged. The mucous membrane of the rectum was inflamed.—Acting Assistant Surgeon J. N. Van Metre.

CASE 591.—Private William Rose, company D, Tod's scouts; age 20; admitted September 12, 1863. Dysentery. The patient was attacked about three weeks before admission. He has from thirty to forty passages daily; the stools are small, very offensive, and full of blood and mucus. There is a great deal of tormina and tenesmus; occasionally there is vomiting. The patient is extremely emaciated. ℞. Calomel eight grains, opium six grains; make ten powders. Take one every three

hours. September 20th: The dysenteric symptoms have subsided, but the patient is much weaker. The passages are now thin, copious, exceedingly offensive, of greenish color. There is but little pain. Prescribed dilute nitric acid with morphia and port wine. Boiled milk diet. October 1st: The diarrhœa continues unchanged. The stomach is so irritable that no solid food is tolerated. There is considerable abdominal tenderness. Continue treatment, and give also injections of sulphate of zinc, two grains to the ounce of water, after each stool. October 7th: Still vomits; tongue dry and cracked. Ordered turpentine emulsion, milk-punch, beef-essence. Died, October 9th. *Autopsy* next day: Both lungs were partially hepatized. The omentum and mesentery were congested. The mesenteric glands were enlarged; and the mucous membrane of the ileum, colon and rectum was inflamed, thickened and ulcerated in many places.—Acting Assistant Surgeon Chauncey D. Palmer.

Case 592.—Private Martin Goodens, company C, 2d Ohio cavalry; age 17; admitted December 27, 1864. Chronic diarrhœa and ascites. [This man appears on the register of hospital No. 1, Nashville, Tennessee, admitted from his regiment December 13th—ascites—transferred to Louisville December 14th; and on the register of the Jefferson hospital, Jeffersonville, Indiana, admitted December 15th—dropsy from disease of the liver—transferred to Camp Dennison December 26th.] Died, March 8, 1865. For some time before death the patient vomited incessantly. *Autopsy* eight hours after death: The thoracic viscera were not examined. The omentum was adherent to the anterior walls of the abdomen. The abdominal cavity contained more than a gallon of fluid. The mesenteric glands were enlarged. The mucous membrane of the intestines was studded with ulcers, and there were deposits of tubercle on the peritoneal coat.

The following case is from the case-book of the Gallipolis Hospital, Ohio, Surgeon Lincoln R. Stone, U. S. V., in charge:

Case 593.—Private Robert Armstrong, company A, 1st New York cavalry; age 32; admitted March 20, 1865. Chronic diarrhœa. [This man appears upon the register of the post hospital, Charleston, West Virginia, admitted September 20, 1864—chronic diarrhœa—sent to general hospital March 20, 1865.] He had been sick several months and was very much emaciated. He had six or eight passages daily; the stools were light colored, contained a good deal of mucus and pus, and were accompanied by great tenesmus; pulse 85; tongue furred; skin dry. ℞. Ipecacuanha eight grains, persulphate of iron fifteen grains, catechu fifteen grains, opium five grains; make eight powders. Take one every two hours. Milk diet. March 21st: Is somewhat better. Continue treatment; give also quinine and iron. March 22d: Diarrhœa continues; has some cough. Continue treatment; add a cough mixture containing squill and paregoric. March 24th: The diarrhœa still continues. Substitute the following: ℞. Persulphate of iron one scruple, tannic acid ten grains, opium five grains; make ten pills. Take one every three hours. March 28th: There is no change in the condition of the patient. Stop medicines and substitute the following: ℞. Fluid extract of gentian and tincture of opium of each half an ounce, brandy seven ounces. Take a tablespoonful three times daily; also a tablespoonful of chalk mixture every two hours. March 29th: Feels better, and is able to sit up most of the time; the diarrhœa, however, continues. Substitute the following: ℞. Ipecacuanha five grains, catechu twenty grains, opium five grains; make five powders. Take one every two hours. Chicken soup. March 30th: Is cheerful and decidedly improving; tongue furred; stomach somewhat irritable. Continue the powders ordered yesterday, every three hours, and give five grains of calomel. March 31st: Toward evening, to-day, the patient, who had been writing home and seemed very much depressed, was allowed a drink of brandy. Subsequently he contrived to get at the brandy-bottle and drank to intoxication. He died next morning, April 1st, at 4 A. M. *Autopsy* nine hours after death: In this case there was a general transposition of the viscera from left to right. The lungs were normal. The heart was situated on the right of the sternum. The pericardium contained a large quantity of serum. The liver was situated in the left hypochondriac region; its right lobe was much smaller than the left; the gall-bladder was distended with bile. The stomach was situated in the right hypochondriac region, its greater extremity being situated to the extreme right. The spleen was situated on the right side. The cæcum was found in the left iliac region; thence the ascending colon rose, crossed the abdominal cavity as usual but in the opposite direction, and descended, forming the sigmoid flexure in the right iliac region. The lower surface of the liver and the stomach were adherent to the transverse colon; the spleen was adherent to the right kidney; the transverse colon was congested and ulcerated, the ulcers penetrating to the peritoneum. The rectum was very much thickened. Acting Assistant Surgeon J. B. Ruttan.

The next case was forwarded on a medical descriptive list from the Seminary Hospital, Columbus, Ohio, Assistant Surgeon Gerhard Saal, U. S. V., in charge:

Case 594.—Franklin Thomas, a drafted man, unassigned; age 38; admitted from Tod barracks July 16, 1864. Diarrhœa. The patient was originally admitted to this hospital with measles June 22, 1864, and was returned to duty July 4th. The attack was mild and uncomplicated. Convalescence seemed to be complete. He was readmitted July 16th with violent abdominal pains, profuse diarrhœa and great prostration. The administration of chalk mixture, quinine and opium, and stimulants, failed to check the disease, and he died July 18th. *Autopsy:* The intestinal mucous membrane was extensively inflamed, and there were large patches of ulceration.—Acting Assistant Surgeon Charles E. Boyle.

The next seven cases were forwarded on medical descriptive lists from West End Hospital, Cincinnati, Ohio, Acting Assistant Surgeon John F. White in charge:

Case 595.—Private Samuel Gibbs, company K, 14th Illinois cavalry; age 48; admitted July 15, 1863. Diarrhœa. At the time of admission the patient had severe diarrhœa and obstinate vomiting. He had been in the saddle three weeks, pursuing the Confederates under Morgan, and was quite exhausted. ℞. Capsicum and opium of each five grains, extract of gentian fifteen grains; make ten pills. Take one every four hours. Beef-essence and wine; extra diet. July 17th: The diarrhœa is better;

the vomiting continues. Prescribed a mixture containing subnitrate of bismuth. July 20th: The diarrhœa is entirely checked, but the vomiting continues and the patient is much exhausted. The skin is covered with cold clammy perspiration, the pulse almost imperceptible. Calomel in grain doses, repeated every fifteen minutes, was now prescribed, and allayed the vomiting in the course of the morning, but the patient continued to sink, and died July 21st. *Autopsy* twenty-four hours after death: Body much emaciated. The lungs were somewhat congested and contained a few crude tubercles. The heart was dilated, its walls quite thin. The liver was healthy. The stomach was somewhat congested. The intestines were distended with flatus. The mucous membrane of the jejunum and ileum was highly vascular and thickly studded with minute points of ulceration and deposits of tubercle. [Enlarged solitary follicles? The condition of the large intestine is not recorded.]—Acting Assistant Surgeon C. T. Simpson.

CASE 595.—Private Edward P. Capron, company F, 20th Michigan volunteers; admitted August 11, 1863. Chronic diarrhœa. The patient stated that he had suffered from diarrhœa since the 13th of May. He is now pale, anæmic, his tongue dry and coated with brown fur, pulse very feeble, extremities cold. Had a chill this morning. To have a sponge bath; citrate of iron and quinia; whiskey-toddy; beef-essence. August 12th: Had involuntary discharges from the bowels this morning. August 13th: Became comatose about six o'clock this morning; is covered with cold clammy perspiration; extremities cold; eyes staring; breathing abdominal. Died, August 14th, at 5 P. M. *Autopsy* twenty-two hours after death: The lungs were congested and the thoracic cavity contained a large quantity of serum. The heart was somewhat enlarged and contained large fibrinous clots. The liver and spleen were enlarged and congested. The mesenteric glands were enlarged. The mucous membrane of the small intestine was congested and presented several ulcers. [The condition of the large intestine is not recorded.] —Acting Assistant Surgeon C. T. Simpson.

CASE 597.—Private George B. Ruston, company C, 79th New York volunteers; age 33; admitted August 18, 1863. Diarrhœa and jaundice. This man had suffered from diarrhœa for some time before coming to hospital. He has now from ten to twelve yellowish watery evacuations daily. He is decidedly jaundiced; complains of pain in the abdomen and in the back; is somewhat emaciated and very feeble. Quinine, whiskey-toddy, beef-essence, &c. Died, August 19th. *Autopsy* twenty hours after death: Body not much emaciated. All the cartilages of the ribs were ossified with the exception of those of the second and third ribs. The lungs were congested. The heart was healthy. The liver and spleen were very large, soft, and engorged with blood. The small intestine was highly congested. [The condition of the large intestine is not recorded.]—Acting Assistant Surgeon C. T. Simpson.

CASE 598.—Private Walter Love, company K, 17th Michigan volunteers; admitted August 12, 1863. Chronic diarrhœa. Died, August 24th. *Autopsy* twenty hours after death: Body extremely emaciated. The heart and lungs were healthy. The omentum was devoid of fat; the mesentery much congested; the mesenteric glands enlarged. The mucous membrane of the intestines was congested and presented numerous minute points of ulceration.—Acting Assistant Surgeon C. T. Simpson.

CASE 599.—Private Jacob Sutton, company B, 17th Michigan volunteers; admitted August 12, 1863. Chronic diarrhœa. Died, August 31st. *Autopsy* twenty-four hours after death: Body extremely emaciated. The lungs were slightly emphysematous. The heart was normal. The liver and spleen were slightly congested. The intestinal mucous membrane was congested throughout, but no ulcers were found. The appendix vermiformis was distended with nearly an ounce of pus.—Acting Assistant Surgeon C. T. Simpson.

CASE 600.—Private Louis M. Brooks, company C, 36th Massachusetts volunteers; admitted August 12, 1863. Chronic diarrhœa. The patient has been sick five months. He is now quite weak and extremely emaciated. Has been free from diarrhœa for the last few days; complains of no pain. Whiskey-toddy. August 18th: The diarrhœa has returned. ℞. Sulphate of iron and sulphate of quinia of each six grains, opium three grains; make twelve pills. Take one three times daily. Extra diet. August 26th: Has some cough, with mucous expectoration; bowels still loose. Stop the pills. ℞. Compound tincture of lavender one ounce, tincture of opium one drachm, white sugar two drachms, camphor water three ounces. Take a tablespoonful after every loose passage. Beef-essence; whiskey-toddy. August 29th: The diarrhœa continues unchecked; the cough is unabated. Substitute a mixture containing subnitrate of bismuth. Died, September 3d. Became delirious a few hours before death. *Autopsy* thirty hours after death: Body extremely emaciated. There were extensive and firm pleuritic adhesions on both sides. The lungs were slightly congested. The abdominal viscera were agglutinated together. The omentum, entirely altered in structure, was adherent to the anterior parietes of the abdomen and to the intestines. There were numerous blood-vessels in the adhesions. The intestines were so firmly bound together that no examination of their mucous membrane was made. The liver was normal but firmly adherent, as was also the spleen, which was thickly studded with tubercular deposits. The mesenteric glands were much enlarged and softened.—Acting Assistant Surgeon C. T. Simpson.

CASE 601.—Private Solomon Stockwell, company E, 27th Michigan volunteers; age 21; admitted August 12, 1863. Chronic diarrhœa. When admitted, this patient, besides his diarrhœa, had tertian intermittent fever. He was very much debilitated, pale and anæmic. The intermittent fever was of later date than the diarrhœa. He had a paroxysm yesterday. Prescribed quinine. August 14th: Has had no chill since admission, and no diarrhœa. His general condition is about the same. Quinine and iron. August 18th: Had a chill to-day. Continue treatment. August 24th: Has had no chill since the 18th; is very weak; pulse feeble. Stop all medicines for the present. Whiskey-toddy, beef-essence, eggs, &c. August 25th: Was somewhat delirious last night. The diarrhœa has recurred; pulse 144 and very feeble; extremities cool. Milk-punch, beef-essence, carbonate of ammonia. August 27th: There it still some delirium; he sleeps but little and is very restless. To take the eighth of a grain of sulphate of morphia at bed-time; repeat if necessary. August 28th: Took two doses of the morphia and slept all night. Feels much better this morning. The diarrhœa still continues. September 2d: The stools are dysenteric in character. Acetate of lead and opium. September 6th: To-day, for the first time, the patient has considerable cough. Bed-sores

are beginning to show themselves. Citrate of iron and quinine. Yeast poultices to the bed-sores. Milk-punch, beef-essence, &c. September 8th: Has numerous dysenteric stools. General condition about the same. ℞. Persulphate of iron ten grains, opium five grains; make ten pills. One every four hours. Continue stimulants. Astringent enemata. September 9th: Is very weak; slept but little last night; is nervous and restless; the bed-sores are more painful; tongue almost clean. Continue treatment. Tannate of lead to the bed-sores. September 11th: Had twenty-five stools last night; pulse 108 and quite feeble; skin cool; tongue very slightly coated; the stools are watery and dark colored. Substitute the following: ℞. Sulphate of quinine twenty grains, iron by hydrogen ten grains, opium five grains; make ten pills. One three times daily. Continue the injections. September 14th: Had nine operations last night. Still coughs; expectorates mucus; complains of pain in the epigastrium; the bed-sores are growing worse. Carbonate of ammonia, beef-tea and milk-punch. Died, September 25th. Was more or less delirious for the last thirty-six hours. *Autopsy* nineteen hours after death: Body much emaciated. The lungs were normal, except the upper lobe of the left lung, which was hepatized posteriorly. The pericardium contained about five ounces of serum. The heart was normal; its right cavities contained a large fibrinous clot. The liver was of a dark-purple color; the gall-bladder was distended with bile. The spleen was very soft and adherent to the abdominal parietes. The omentum was transformed into a soft gelatinous mass. The intestinal mucous membrane was highly congested, and the large intestine was ulcerated.—Acting Assistant Surgeon C. T. Simpson.

The next nine cases are from the case-book of the MADISON HOSPITAL, Madison, Indiana, Surgeon Gabriel Grant, U. S. V., in charge from the date of the first case to January, 1865; afterward Surgeon John H. Rauch, U. S. V.:

CASE 602.—Private Levi Engle, company I, 80th Ohio volunteers; admitted August 25, 1863. Chronic diarrhœa of six months' duration. The patient was debilitated and much emaciated; his pulse, which ranged from 80 to 90, was feeble but regular; the tongue was clean; the diarrhœa was not very troublesome, there being only three or four thin light-colored evacuations daily; his appetite was good. Generous diet and porter were prescribed. He gradually lost strength, and died September 5th. *Autopsy:* The small intestine and some portions of the large were congested, and there was some slight thickening of a portion of the sigmoid flexure, but no ulcers were found either in the small intestine or the upper portion of the large. There were, however, a few points of recent ulceration, and some few cicatrices of old ulcers in the lower part of the colon and upper part of the rectum. There were four intussusceptions in the small intestine, one nine inches in length, one four inches long, and the other two an inch each.—Acting Assistant Surgeon R. Charlton.

CASE 603.—Private John O'Brien, company F, 107th Indiana volunteers; admitted September 26, 1863. Chronic diarrhœa. [This man appears on the register of the Brown hospital, Louisville, Kentucky, admitted August 17th—chronic diarrhœa—sent to general hospital September 26th.] The patient was greatly debilitated and emaciated. September 27th: The following was ordered by Dr. Schultz: ℞. Citrate of iron and quinia two scruples, whiskey four ounces. Take a tablespoonful three times a day. October 16th: Ordered half a grain of sulphate of morphia twice a day. October 18th: Renew the citrate of iron and quinia with whiskey. October 28th: Dover's powder, in five-grain doses, to be used as needed. October 30th: Ten grains of blue mass in three pills, followed, after four hours, by a drachm of calcined magnesia. November 2d: Twenty grains of Dover's powder to be taken in three doses during the day. November 3d: ℞. Acetate of lead fifteen grains, powdered opium six grains; make six powders. To be used as needed. November 7th: The reporter took charge of the case. At this time the patient's tongue was red at its edges, its centre covered with a whitish fur; the dejections varied in number—some days there were only one or two, on others twelve to fifteen; they were fluid, dark in color, but not large; there was little or no abdominal tenderness; the appetite was good, but there was considerable thirst; the skin was dry and scaly; the motions were accompanied by but little pain, and there was no tenesmus. ℞. Acetate of lead fifteen grains, opium six grains, ipecacuanha three grains; make five powders. Take one every four hours. Milk-punch; gum-water as a drink. November 16th: Substitute the following: ℞. Subcarbonate of bismuth two drachms, opium and ipecacuanha of each five grains; make twelve powders. Take one every four hours. November 18th: Continue treatment. November 25th: The patient has slowly improved to this date. He was able to walk around, and the dejections seldom exceeded two or three daily; but as the stock of bismuth on hand was exhausted, the following was prescribed: ℞. Acetate of lead twelve grains, opium and ipecacuanha of each six grains; make six powders. Take one every four hours; also sponge the surface with alcohol. On thanksgiving day (November 26th) the patient unfortunately ate largely of turkey, dressing, &c. The result was the diarrhœa became worse than before. His bowels having been moved thoroughly, he was ordered to take pills containing each half a grain of opium and quarter of a grain of persulphate of iron. This was continued until December 10th, when, a fresh supply of bismuth having been received, it was again prescribed as before, and the patient steadily improved, the stools being again reduced in number to from one to three daily. December 25th, however, he was again suddenly taken worse. He now complained of nausea, and of pain in the right side over the region of the liver. He appeared weak and prostrated. A blister was applied to the side, and the following was ordered: ℞. Sulphate of quinia six grains, powdered capsicum one grain; make three powders. To take one three times a day. The stomach, however, was now so irritable that these pills were rejected, and in spite of the use of brandy, milk-punch, and beef-tea, he rapidly sank. He died December 30th. *Autopsy* eighteen hours after death: Body very much emaciated. The lungs and heart were healthy. The heart was firmly contracted, and contained in its right auricle a large fibrinous clot. The right lung was adherent throughout its whole extent to the pleura costalis. The liver was normal; the gall-bladder full of bile. The pancreas and spleen were normal. The inferior portion of the right kidney presented a cyst containing an ounce of fluid; in all other respects the kidneys appeared to be healthy; the bladder was full of urine. Upon raising the intestines the duodenum tore across without any violence having been used; it was found to be much softened. The rest of the intestines were healthy in appearance, except the rectum, which was congested, but not ulcerated or softened. The stomach contained about a pint of dark fluid resembling coffee grounds.—Acting Assistant Surgeon D. A. Morse.

CASE 604.—Private Ezra Stratton, company C, 33d Ohio volunteers; admitted April 8, 1864. Chronic diarrhœa. [This man appears on the register of the Cumberland hospital, Nashville, Tennessee, admitted February 25, 1864—gunshot wound of the right cheek—sent to Louisville April 4th. He is borne on the register of Clay hospital, Louisville, admitted April 4th—chronic diarrhœa—sent to general hospital April 7th.] The disease persisted, in spite of treatment, until April 17th, when pneumonia set in. The symptoms were cough, difficult expectoration, and severe pain in the chest. Crepitant rale was heard at the apex of each lung; the pulse was quick and feeble; the diarrhœa still persisted. Tonics and stimulating expectorants were prescribed, afterward stimulants. Died, April 20th. *Autopsy* twenty-four hours after death: Body very much emaciated; apparent age 21; height five feet four inches. The pericardium contained three ounces of serum. The heart was normal in size, but flabby. The middle lobe of the right lung was in the stage of red hepatization, passing into gray; the upper lobe of the left lung was in the stage of red hepatization; the rest of the lung-tissue was normal. The spleen was normal in size, but soft. The liver soft and engorged with blood. Both kidneys were normal. The stomach was normal. The colon was thickened, softened and congested. The descending colon and rectum were ulcerated. The bladder was distended with urine.—Acting Assistant Surgeon George F. Gill.

CASE 605.—Private Henry Playford, company D, 16th United States Infantry; age 28; admitted April 8, 1864. Chronic diarrhœa. [This man appears on the register of hospital No. 8, Nashville, admitted February 28th—acute diarrhœa—sent to Louisville April 6th; and on the register of Clay hospital, Louisville, admitted April 6th—chronic diarrhœa—sent to general hospital April 7th.] The patient was much emaciated and unable to walk about. The stools were frequent and copious. Treatment: Opium, stimulants, nutritious diet. He appeared to improve for a day or two; but on May 11th vomiting suddenly set in, and he died at 5 P. M. *Autopsy* twelve hours after death: The left lung was healthy; there were extensive pleuritic adhesions on the right side; the upper and middle lobes of the right lung were in the stage of red hepatization, the lower lobe much congested; a few softened tubercles were found near the root of the lung. The heart was small and firmly contracted; clots were found in both cavities, the largest being in the right side. The stomach contained some stercoraceous matter of a yellowish color; its mucous membrane was very much corrugated; a portion of it was coated with unhealthy looking mucus, and presented a few points supposed to be ulcers. The small intestine was healthy. The mucous membrane of the colon was congested, thickened and softened. The mesenteric glands were tubercular. The liver was abnormally friable. The spleen was healthy.—Acting Assistant Surgeon T. B. Gerard.

CASE 606.—Private A. S. Huntington, company K, 1st Wisconsin cavalry; age 32; admitted April 8, 1864. Chronic diarrhœa. [This man appears on the register of the Cumberland hospital, Nashville, admitted March 13th—chronic diarrhœa—sent to Louisville April 4th; and on the register of Clay hospital, Louisville, admitted April 4th—chronic diarrhœa—sent to general hospital April 8th.] When first seen by the reporter, May 1st, he was greatly emaciated; the discharges from the bowels were frequent, watery and very offensive. He died May 14th. *Autopsy* six hours after death: The pericardium contained about two ounces of serum. Both lungs were thickly studded with miliary tubercles and contained numerous vomicæ; the left lung was adherent posteriorly and to the diaphragm. The heart and its valves were normal. The liver, spleen and kidneys were also normal. The mucous membrane of the stomach was thickened and congested; no intestinal lesions, such as would account for the diarrhœa, were recognized. The mesenteric glands were tubercular, and some of them cretefied.—Acting Assistant Surgeon T. B. Gerard.

CASE 607.—Private Michael Sommers, company E, 45th New York volunteers; admitted June 29, 1864. Diarrhœa. [This man appears on the register of hospital No. 1, Nashville, Tennessee, admitted from Chattanooga May 24th—chronic bronchitis—sent to Louisville May 30th; and on the register of the Jefferson hospital, Jeffersonville, Indiana, admitted May 31st—chronic bronchitis—sent to general hospital June 28th.] The patient was delirious, extremely emaciated and greatly debilitated. He had frequent stools containing mucus and blood, cough and muco-purulent sputa. Coarse mucous rales could be heard on both sides of the chest. He died next day. *Autopsy* sixteen hours after death: Pleuritic adhesions, both old and new, were found on both sides, but there was no effusion into either sac. Both lungs were tuberculous throughout, and had very large vomicæ in their apices. The heart was flabby and contained large fibrinous clots. The stomach was congested. The small intestine was also congested. The large intestine was ulcerated throughout, more especially in the cæcum, which was much thickened; the ulcers were large and arranged transversely. The liver was friable. The kidneys were very large and flabby.—Acting Assistant Surgeon Joseph G. Rogers.

CASE 608.—Private John W. Wood, company F, 123d Indiana volunteers; age 19; admitted July 3, 1864. Diarrhœa and scrofula. [This man appears on the register of the Cumberland hospital, Nashville, admitted from Resaca, Georgia, May 25th—pneumonia—sent to Louisville June 5th; and on the register of the Joe Holt hospital, Jeffersonville, Indiana, admitted June 6th—diarrhœa—sent to Madison July 2d.] This man when admitted had some diarrhœa, cough, and enlargement of the lymphatic glands on the left side of the neck. He was very much emaciated. Tincture of iodine was applied to the glandular enlargements, and half an ounce of cod-liver oil and whiskey ordered to be taken three times a day. Full diet. July 26th: The diarrhœa is very troublesome and the patient very weak. He complains of sore throat; the enlarged cervical glands are painful. To take every four hours a pill containing a grain of opium and two grains of acetate of lead. Sherry wine; chicken diet. July 27th: The diarrhœa is less troublesome. Continue treatment; also egg-nog made with brandy given freely. July 28th: The patient is failing rapidly; his extremities are cold; pulse quite feeble. Died, July 29th. *Autopsy* ten hours after death: Body much emaciated; rigor mortis slightly marked. Brain not examined. Both lungs were congested, the left more so than the right, and both were adherent to the thoracic parietes, though the adhesions were not strong; they were more firmly adherent to the diaphragm. The bronchial tubes appeared to be thickened and contained a muco-purulent secretion. The right pleural sac contained four ounces of serum. The pericardium contained two ounces and a half of serum. The heart was normal. The abdomen was very prominent; upon opening its cavity it was found impossible to separate the viscera from the parietes. The peritoneum was greatly thickened (three-quarters of an inch thick anteriorly) and adherent to the intestines.

Pus was found in several places in the abdominal walls next to the peritoneum. All the abdominal organs were strongly inter-adherent—so strongly that it was impossible to separate them without dissection. The liver was large but apparently healthy. The spleen enlarged and friable. The kidneys were normal. The mesenteric glands were tubercular, and in places the lymph coating the knuckles of intestine had a cheesy character. The folds of intestine could not be separated except by dissection. The mucous membrane of the large intestine was thickened. The bladder was moderately distended with urine.

CASE 609.—Private Abraham Floyd, company G, 31st Indiana volunteers; age 35; admitted August 17, 1864. Chronic diarrhœa and scrofulous ulcers on the right leg. [This man appears upon the register of the Cumberland hospital, Nashville, Tennessee, admitted June 19th—sore arm from vaccination—sent to Louisville July 6th; and on the register of the Jefferson hospital, Jeffersonville, Indiana, admitted July 7th—ulcers of right leg—sent to Madison August 17th.] He was first seen by the reporter January 5, 1865. He was then greatly emaciated and very anæmic; the stools were frequent, liquid, and accompanied by severe pain; the abdomen was exceedingly tender; the tongue was clean and moist, but red; the pulse 90 and weak. Citrate of quinia and iron was prescribed in sherry wine, with a generous diet. He improved rapidly, and by the middle of February was thought to be so far recovered as to need no medicine. March 2d: He had a slight attack of jaundice which lasted about fifteen days, after which he again began to improve. On the first of April he complained of headache, vertigo, dizziness and weakness, and had sharp but transient pains in all parts of the body. He continued to grow worse for a week, when he had a slight chill, followed by fever, thirst, heat of skin, &c. His tongue now became dry and red; bowels loose; abdomen tympanitic and tender; pulse 100 and weak. There was great dejection of spirits, and occasionally mental aberration. On the 13th of April a rose-colored eruption was observed scattered over his abdomen and breast. He was treated with turpentine emulsion, wine and egg-nog. By the 20th he was apparently convalescing; his tongue was moist and his bowels more natural. April 23d: He complained of severe pain in the chest; pulse 120; bowels again very loose; tongue red but moist. Delirium of a low muttering kind now set in. Applied a sinapism to the chest, and prescribed a mixture containing fluid extract of ipecacuanha and veratrum viride, in addition to the turpentine emulsion. Stimulants as before. April 27th: There was retention of urine, requiring the use of the catheter. At 3 P. M. copious clammy perspiration set in. He died at 5 P. M. *Autopsy* sixteen hours after death: The brain was normal except that the Pacchionian bodies were unusually prominent. There were firm pleuritic adhesions on both sides. Both lungs were studded with miliary tubercles. The pericardium contained an ounce of serum. The heart was normal. The stomach was empty and healthy. The liver was pale and flabby; the gall-bladder contained five black gall-stones but no bile. The spleen was normal. The lower portion of the ileum was inflamed; the glands of Peyer were thickened. The descending colon was in a state of chronic inflammation and ulceration; several hard lumps of fæcal matter were found in the pouches of the colon.—Acting Assistant Surgeon John E. Frey.

CASE 610.—Private Peter Dawer, company C, 57th Illinois volunteers; age 45; admitted May 3, 1865. Chronic diarrhœa. [This man appears on the register of the field hospital of the 4th Division, 15th Corps, admitted April 2d—chronic diarrhœa—sent to general hospital April 3d. He next appears on the register of the hospital transport Ben Deford, taken on board at Hatteras Inlet, North Carolina, April 6th, sent to general hospital April 8th; and on the register of the McDougall hospital, New York harbor, admitted April 8th—chronic diarrhœa—sent to general hospital April 25th.] The patient stated that he was with General Sherman in his campaign to the coast, and was sent to McDougall general hospital, New York, from thence here; also that he had suffered from lung trouble every spring for the past three years. His chest presented evidences of frequent blistering. He was greatly emaciated; his skin sallow and dry. He had an obstinate cough, with white viscid sputa. He also suffered from an obstinate diarrhœa, having from fifteen to twenty stools daily. His lower extremities were œdematous, nevertheless, his appetite was voracious. He died May 18th. *Autopsy* twenty-four hours after death: Height five feet nine inches; rigor mortis slight; emaciation extreme. There were extensive pleuritic adhesions on both sides. The left pleural cavity contained twelve ounces of purulent serum. Both lungs were congested. The pericardium contained four ounces of serum. The heart and its valves were normal; both ventricles contained firm clots. The peritoneum contained about twenty ounces of bloody serum. The spleen was normal. The descending colon was ulcerated.—Acting Assistant Surgeon W. H. Sheets.

## The next four cases were forwarded on medical descriptive lists from the HOSPITAL AT QUINCY, Illinois, Surgeon Robert Niccolls, U. S. V., in charge:

CASE 611.—Private William Bodle, company H, 3d Ohio volunteers; age 37; admitted February 15, 1853. Chronic diarrhœa. This man had been sick since October last. Has now from six to eight evacuations daily; is weak, very much emaciated, and has some cough; his tongue is clean; pulse natural. To take pills of sulphate of copper and opium three times daily. February 24th: Bowels not so loose. To take pills as occasion requires, and a drachm of elixir of cinchona at each meal with ale. March 1st: Is very hoarse; bowels loose again. Renew the pills. March 16th: Diarrhœa about the same. The patient coughs a little. His parotid gland is swollen, which was attributed to mumps, to which he had been exposed. To take three grains of quinia every four hours. March 20th: Pulse 100 and full; complains of pain in the lower part of the right side of the chest; has a severe cough and free expectoration. To take pills of quinine and iron. Low diet. March 21st: Bowels very loose; evacuations copious; pulse 120; skin hot; tongue furred. To take turpentine emulsion besides the pills. Low diet. March 22d: Pulse feeble; cough severe; complains of pain beneath the right nipple; bowels still very loose. Brandy every two or three hours. 6 P. M.: Has failed during the day; pulse nearly gone; sputa purulent and bloody; coughs constantly. March 23d: No better. Expectoration still continues; pulse very feeble. Died, March 24th, at 10.30 A. M. *Autopsy* twenty-four hours after death: The right lung was entirely hepatized and pus was infiltrated through its parenchyma; the lung was everywhere bound to the thoracic parietes by adhesions which appeared to be recent; the left lung was healthy, except some congestion of the upper lobe. The heart was healthy; fibrinous clots were found in both ventricles. The liver

and spleen were normal. The stomach was healthy. Some parts of the small intestine were darkly congested. [The condition of the large intestine is not recorded.]—Acting Assistant Surgeon F. K. Bailey.

CASE 612.—Private Harrison Lawrence, company G, 74th Indiana volunteers; age 46; admitted March 10, 1863. Diarrhœa. This man had been suffering with diarrhœa since October 26, 1862. When admitted he appeared to be in pretty good health. On the night of March 11th he was taken with a chill, followed by fever and some soreness of the throat. He complained of difficulty of breathing whenever he turned on his back. He stated that he had had frequent paroxysms of dyspnœa during the last four months. March 13th, at 8 A. M., he suddenly sprang out of bed, walked a few steps, and fell dead. *Autopsy* seven hours after death: A heart-clot was found in the right ventricle formed around an adventitious membrane [?], which fully explained the difficulty of breathing; also the sudden death. [There is no record of the condition of any of the other organs.]

CASE 613.—Private Hieronymus Weitner, company E, 16th Illinois cavalry; age 40; admitted September 11, 1863. Acute dysentery. The patient had been sick four days in camp near the city. When admitted his tongue was coated and red at the tip; skin moist; voice husky; face sunken. He had bloody stools, with tormina and tenesmus. ℞. Opium five grains, sulphate of quinia ten grains, mercury with chalk ten grains; make five powders. Take one every four hours. Low diet. September 15th: Symptoms unchanged, except that there was some nausea after taking the powders yesterday evening. Stop the powders. ℞. Opium five grains, camphor five grains; make five pills. Take one every four hours. September 16th: Bowels still very loose, with blood and slime; tormina severe; pulse 120. Continue the pills, with laudanum enemata. Low diet. September 17th: Discharges dirty-yellow and very offensive, but less in quantity. Continue the pills and enemata, with two grains of quinine every four hours. Beef-soup. September 18th: Has somewhat less pain; tongue coated white; pulse 120 and small. Continue quinine. Stop opium and camphor. Enemata as before. Soup. September 19th: Bowels moved frequently during the night. Continue treatment and diet. September 20th: Discharges thin and copious; tongue less coated but dry; pulse 130; stools very offensive. Stop quinine. ℞. Tannic acid one scruple, camphor twelve grains, opium eight grains; make eight powders. Take one every two hours. Continue enemata and diet. September 21st: Pulse 130; discharges less frequent, but the patient is becoming very weak; tongue dry and rough; respiration hurried. Continue treatment. Whiskey and water. Died, September 22d. *Autopsy* ten hours after death: Body emaciated; rigor mortis excessive. [The condition of the thoracic viscera is not recorded.] The liver, spleen, omentum, stomach and small intestine were healthy. The whole extent of the colon was much diseased; its peritoneal coat congested, and in the descending portion adherent to the abdominal parietes; the mucous membrane was disorganized, and all the coats were so soft as to be easily torn with the fingers.—Acting Assistant Surgeon F. K. Bailey.

CASE 614.—Private George S. Dean, 1st Iowa battery; age 24; admitted January 11, 1864. Chronic diarrhœa. Has had diarrhœa since July last. At present he has from five to seven discharges from the bowels daily; they are light colored and frothy. He also suffered during the fall and early winter with intermittent fever, but has had no chill since Christmas. He is now much emaciated; his eyes sunken and languid; tongue clean and red; pulse 100 and very weak. Treatment: Turpentine emulsion and pills of nitrate of silver and opium. Milk diet. January 25th: Is improving a little; says he feels stronger than when admitted. January 30th: Occupies his bed most of the time, and rests poorly at night. To take an opium pill at bed-time. February 4th: Complains of pain in the left shoulder. February 10th: The diarrhœa is improving; he has only three or four discharges daily, but still complains of pain in the left shoulder. February 16th: Has severe pain in the right breast, with dyspnœa; coughs frequently, and expectorates frothy sputa mixed with blood; the extremities are cold. Treatment: Quinine and opium with whiskey-punch; hot flannels, mustard to extremities, hot bath, &c.; but all failed to bring about reaction. Died, February 17th. *Autopsy* twelve hours after death: There were no pleuritic adhesions. The right lung was engorged with blood, its middle and lower lobes partly hepatized, sinking in water; the left lung was healthy. The pericardium contained half a pint of pale-yellow serum, its inner surface was roughened. The heart was somewhat enlarged; its right ventricle contained a large yellow fibrinous clot; its walls were thinner than usual; the left ventricle contained a small fibrinous clot. The liver was enlarged, its peritoneal covering roughened, but no adhesions were discovered. The spleen was very much enlarged, weighing two pounds eleven ounces. The mucous membrane of the stomach presented points of inflammation. There were several ulcers in the ileum. The mucous membrane of the colon was disorganized by inflammation. No fluid was found in the abdominal cavity. The kidneys and bladder were not examined.—Acting Assistant Surgeon D. C. Owen.

The next sixty-nine cases are from the case-book of the HOSPITAL OF THE PRISON DEPOT, Rock Island, Illinois, Surgeon William Watson, U. S. V., in charge. All the patients were Confederate prisoners of war.

CASE 615.—Sergeant John L. Lewis, company I, 5th Tennessee; admitted May 7, 1864. Chronic diarrhœa. Died, November 1st. *Autopsy* six hours after death: There were extensive pleuritic adhesions on both sides. The heart was normal. The liver was congested; the gall-bladder very much distended with bile. The spleen was smaller than normal. The pancreas and kidneys appeared to be healthy. The mesenteric glands were enlarged and very much disorganized. The solitary follicles of the small intestine were ulcerated. The descending colon and rectum were extensively ulcerated.—Acting Assistant Surgeon H. H. Russell.

CASE 616.—Private Francis M. Carmichael, company F, 56th Alabama cavalry; admitted November 2, 1864. Acute diarrhœa. This man had measles last August, followed by intermittent fever. About the middle of September he had erysipelas of the face. November 1st, he was attacked with diarrhœa. The stools were frequent, muco-purulent and streaked with blood.

He had also severe pains in the left side and in the bowels. To take ten grains of blue mass with one of opium at bed-time; a mustard plaster to the side. November 3d: No better. To take a drachm of sulphate of magnesia and half a grain of opium every four hours. November 6th: Add an ounce of whiskey every four hours. Died, November 10th. *Autopsy* twelve hours after death: Body much emaciated. The right lung was highly congested. The heart was very large, but apparently healthy; no valvular disease. The liver and spleen were much enlarged and congested, and the peritoneum could readily be stripped off from them. The mucous membrane of the ileum was congested, softened and ulcerated in patches. The descending colon and rectum were extensively ulcerated and of a dark-bluish color.—Acting Assistant Surgeon Morris Hale.

Case 617.—Sergeant James O'Grady, company A, 13th Louisiana; admitted April 16, 1864. Chronic diarrhœa. Died, November 13th. *Autopsy* twelve hours after death: Body extremely emaciated. The lungs, heart and liver were normal; the gall-bladder was distended with bile. The spleen was small but healthy. The pancreas and kidneys were normal. The mesenteric glands were very much enlarged. The descending colon and rectum were ulcerated. The mucous membrane between the ulcers was congested and softened.—Acting Assistant Surgeon H. C. Newkirk.

Case 618.—Private Thomas F. Rowe, company D, 3d Georgia cavalry; age 42; admitted November 6, 1864. Diarrhœa. The patient was greatly debilitated and much emaciated; pulse 120, small and weak; tongue brown and dry; sordes on the teeth. He had frequent small stools attended by tenesmus, and the physical signs of pneumonia on the right side. Treatment: Nitrate of silver, opium, whiskey, &c. Died, November 15th. *Autopsy* twenty-four hours after death: The right lung was hepatized red. The pericardium was distended with fluid. The stomach, spleen and liver were normal; the gall-bladder was distended with a colorless albuminous liquid. The small intestine was highly inflamed, and presented seven intussusceptions. The rectum was ulcerated.—Acting Assistant Surgeon N. B. Matthews.

Case 619.—Private John Davis, company B, 31st Alabama; age 20; admitted September 1, 1864. Chronic diarrhœa. This was a young man of slender frame, with blue eyes, light hair and complexion. He was treated for diarrhœa first by Dr. Mills, afterward by Dr. Young. The latter employed the sustaining and stimulant plan of treatment, giving quinine, iron and wine, with an occasional opiate, yet the patient continued to grow weaker, and began to have a slight cough accompanied by expectoration of large quantities of yellowish pus. November 10th: He was transferred to ward O with the diagnosis phthisis pulmonalis. He was still expectorating pus, but not so profusely as he had been doing; pulse 80 and weak; tongue red. There was a good deal of abdominal tenderness, especially in the region of the liver. The patient was very weak and feeble, and had no appetite. He had very little cough, but his diarrhœa still continued. His countenance was pinched and anxious. Treatment: Cod-liver oil, milk-punch, beef-tea, &c. A few days subsequent to his transfer to ward O he again commenced expectorating pus very freely; it appeared to be mixed with bile. He continued to expectorate freely till death, November 21st. *Autopsy* twelve hours after death: Body greatly emaciated. The blood appeared to be in an impoverished condition. The left lung was healthy; the right lung was adherent to the diaphragm. The liver was much enlarged and adherent to the diaphragm; it contained twelve distinct abscesses varying from the size of a hulled walnut to that of a goose-egg, and containing in all about a pint and a half of pus; one of these abscesses had discharged through the diaphragm and adherent right lung into the bronchial tubes; the gall-bladder was empty. The mesenteric glands were enlarged. The mucous membrane of the small intestine was congested; that of the colon and rectum ulcerated.—Acting Assistant Surgeon H. C. Newkirk.

Case 620.—Private William C. Carpenter, company C, 26th Virginia; admitted November 11, 1864. Typhoid pneumonia. Died, November 21st. *Autopsy* twelve hours after death: The left lung was healthy. The right pleural sac contained a quantity of fluid. There were some pleuritic adhesions, and the right lung was coated with a large quantity of pus-like lymph. The right side of the heart contained clots which extended into the pulmonary artery. The mesenteric glands were enlarged, and there was ulceration of the colon and rectum.—Acting Assistant Surgeon H. C. Newkirk.

Case 621.—Private Emory Hutchings, company E, 17th Texas; age 48; admitted October 18, 1864. Chronic diarrhœa. This man was captured September 15, 1863. He was first attacked with diarrhœa July 6, 1864, and has been twice in hospital on this account before his present admission. Is much emaciated; appetite very poor; skin dry and wrinkled; features shrunken, giving him the appearance of being older than he is. He has from ten to twelve loose stools daily, and complains of considerable pain and tenderness in the abdomen, particularly in the left iliac region. His feet and legs are œdematous, and both upper and lower extremities partially paralyzed. He is inclined to sleep all the time. To take a drachm of sulphate of magnesia and a grain of opium three times a day; ten grains of Dover's powder at bed-time. Milk-punch; nourishing diet. Quinine and iron were subsequently added. Under this treatment the diarrhœa improved, the œdema subsided, but the patient remained feeble and emaciated. The œdema of the legs returned November 15th, and by the 20th the hands and arms became œdematous. On the 22d the diarrhœa became worse, the stools increasing in frequency to five or six daily, and sometimes they escaped in bed. He died November 25th. *Autopsy* twenty hours after death: Near the base of the skull a large irregular bony protuberance was found, supposed to be the result of an ancient fracture. There were pleuritic adhesions on the left side, but the lungs were normal. The heart was flabby, and contained a well-washed white clot which extended four or five inches into the pulmonary artery on the right side. The blood in the great veins was thin and fluid. The liver and spleen were enlarged, congested and softened; the gall-bladder was distended with viscid bile. The mucous membrane of the intestines was congested and thickened throughout; in the colon and rectum it was extensively ulcerated. The mesenteric glands were enlarged and softened.—Acting Assistant Surgeon J. B. Young.

Case 622.—Private Marshall Mitchell, company B, 3d Tennessee; age 40; admitted November 15, 1864. Diarrhœa and consumption. This man had a furred tongue; obstinate diarrhœa; pulse 120 and weak. His respiration was hurried and labored, and he complained of a sense of constriction or tightness across the chest. The lungs were clear on percussion, but

subcrepitant rale was heard on auscultation. There was scanty expectoration of tough viscid mucus. R. Rochelle salts one drachm, powdered opium half a grain, every four hours. Cod-liver oil three times a day. Died, November 25th. *Autopsy* twelve hours after death: Both lungs were emphysematous, and a few calcareous tubercles were found in the apex of each. The liver and spleen were small. The mesenteric glands were enlarged. The mucous membrane of the small intestine and of the colon was congested. The rectum was ulcerated.—Acting Assistant Surgeon H. C. Newkirk.

CASE 623.—Sergeant Leonidas Hedrick, company H, 1st Tennessee cavalry; admitted November 13, 1864. Diarrhœa. Died, November 27th. *Autopsy* twenty-four hours after death: Body much emaciated. The right lung was slightly congested; the left lung contained a deposit of tubercles and was hepatized gray. The heart was normal. The liver was fatty. There was an intussusception in the small intestine. The mucous membrane of the large intestine was ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. E. Brooke.

CASE 624.—Private Jackson Wiley, company I, 63d Georgia; age 24; admitted November 21, 1864. Typhoid pneumonia. This man when admitted had cough; hurried respiration; furred tongue; pulse 120 and weak. There was dulness on percussion, and mucous rales on both sides. The abdomen was tender on pressure. Died, November 27th. *Autopsy* twelve hours after death: Each pleural sac contained a quantity of serum. The right lung contained tubercles and was hepatized. The heart was large and contained large clots. The stomach was distended with gas. The small intestine was congested. The colon and rectum were ulcerated. The spleen was large and soft.—Acting Assistant Surgeon H. C. Newkirk.

CASE 625.—Private James H. Dorris, company D, 12th Arkansas; age 40; admitted August 27, 1864. Chronic diarrhœa. Died, November 27th. *Autopsy:* Both pleural sacs contained serum mixed with pus, and a large amount of pus adhered to the surfaces of the lungs. The heart was very small, the mitral valve diseased, and the walls of the left ventricle extremely thin. The intestinal mucous membrane was somewhat congested.—Acting Assistant Surgeon H. C. Newkirk.

CASE 626.—Private Peter White, company D, 63d Virginia; admitted November 9, 1864. Chronic diarrhœa. This patient had also scorbutic symptoms, and toward the last pneumonia. Died, November 28th. *Autopsy* seventeen hours after death: Almost the whole of the right lung was in the stage of red hepatization. The acini of the liver were pale; the interlobular spaces dark. [Congestion of the portal vein?] The colon was extensively ulcerated, and the rectum was almost gangrenous.—Acting Assistant Surgeon Washington Matthews.

CASE 627.—Ephraim Winfield, citizen of Missouri; admitted November 30, 1864. Diarrhœa. Died the same day. *Autopsy* one hour after death: Body pale and emaciated. The heart was normal in size; its valves healthy; its muscular substance had a pale-bluish color and was softer than usual. The apices of both lungs contained an excess of black pigment; there was a slight pleuritic adhesion on the left side; the right pleural cavity contained about eight ounces of serum; the posterior part of the right lung was in the stage of gray hepatization. The liver was normal; the gall-bladder distended with bile. The small intestine was congested, and there was an intussusception in the ileum. The transverse and descending colon were very much thickened, their mucous membrane presenting a gangrenous appearance throughout; near the centre of the transverse colon was an ulcer the size of a half dollar, which extended through all the coats. [Perforated?] The mesenteric glands were enlarged. The omentum was highly congested. The pelvic cavity contained about twelve ounces of sanious fluid, with some detached flakes of lymph. The other organs were normal.—Acting Assistant Surgeon H. H. Russell.

CASE 628.—Alfred Piles, Missouri guerilla; admitted November 24, 1864. Acute dysentery. No previous history. Died, December 1st. *Autopsy* twenty-four hours after death: The lungs and heart were normal. The intestines were distended with gas. The intestinal mucous membrane was much congested; in the rectum it was softened and ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. M. Witherwax.

CASE 629.—Private Warwick Butcher, company B, 19th Virginia cavalry; age 45; admitted September 28, 1864. Chronic diarrhœa. This man's general health was good before his enlistment in the Confederate army, March, 1862. He soon after had an attack of fever followed by rheumatism, from which he suffered most of the time he was in service. Was at home sick when captured, August 29, 1863, and was sent to Camp Chase, Ohio. He was ailing all the time while there, and at one time was in hospital with pneumonia, from which he recovered, but continued to have rheumatic symptoms until January, 1864, when he was transferred to Rock Island barracks. His general health at that time was moderately good, and continued so, with spells of indisposition, until August, when he was attacked by diarrhœa, which persisted until he was admitted to hospital. He then slightly improved until the weather became cold and snow fell, in the early part of November, when he took cold and grew rapidly worse. He was transferred to ward I November 14th; was first seen by the reporter on that day. He was then suffering from violent diarrhœa, and had a severe chill which lasted all the afternoon and until the next morning, when symptoms of pneumonia made their appearance. There was some fever and a very troublesome cough. The patient was restless, could not sleep, and had no appetite. The treatment was tonic and stimulant, with anodynes and expectorants. Died, December 3d. *Autopsy* five hours after death: Both lungs were full of miliary tubercles. The heart was normal. The blood was very thin and deficient in red corpuscles. The peritoneum covering the abdominal viscera and lining the abdominal parietes was studded with tubercles. The abdominal viscera were interadherent and the liver adhered to the diaphragm. The mucous membrane of the large intestine was thickened and softened. The lower part of the descending colon and the rectum were ulcerated.—Acting Assistant Surgeon J. B. Young.

CASE 630.—Private William J. Davis; age 35; admitted December 2, 1864. Chronic diarrhœa. This man was conscripted about the first of October last, and was attacked with diarrhœa soon after. He deserted about the first of November, and was detained as a prisoner of war. When admitted he was much emaciated and had a peculiar pinched, cadaverous expres-

sion of countenance. His pulse was small and about 140; surface cold; stools involuntary; no appetite; tongue dry and pointed. He was inclined to sleep all the time. Treatment: Tonics, stimulants and opiates. Died, December 5th. *Autopsy* eight hours after death: Both lungs contained tubercles at their apices; the lower lobe of the right lung was hepatized. The heart was dilated and contained a large fibrinous clot in its right side. The mucous membrane of the intestines was congested and softened. The solitary follicles of the small intestine were enlarged. Patches of sloughing were found in the colon and rectum.—Acting Assistant Surgeon J. B. Young.

Case 631.—Charles S. Jordan, Missouri guerrilla; admitted November 20, 1864. Typhoid pneumonia. Died, December 6th. *Autopsy* twelve hours after death: The lower lobe of the right lung was hepatized. The right auricle of the heart contained clots. The small intestine was inflamed; the solitary glands enlarged. The mucous membrane of the colon and rectum was softened and ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. M. Witherwax.

Case 632.—James M. Clanahan, citizen of Missouri; admitted November 30, 1864. Diarrhœa. Died, December 6th. *Autopsy* sixteen hours after death: Body very little emaciated. The thoracic organs were normal. The liver was normal. The stomach was greatly distended. The solitary glands of the small intestine were enlarged. The large intestine was very much thickened and extensively ulcerated from the cæcum to the rectum. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. E. Brooke.

Case 633.—Private William A. King, company H, Wood's Missouri guerrillas; age 37; admitted November 29, 1864. Acute diarrhœa. This man was conscripted October 14th and deserted ten days afterward. He had diarrhœa at the time, and it persisted. Was detained as a prisoner of war and sent to Rock Island. When admitted he had ten to twenty copious stools daily; was much emaciated; tongue brown and dry; pulse weak and rather slow; skin dry and husky. He had no appetite, and was inclined to sleep much of the time; when awake seemed moody and dispirited. To take a drachm of sulphate of magnesia with a grain of opium three times a day, and enemata containing acetate of lead. Milk-punch. Died, December 8th. *Autopsy* four hours after death: Some congestion of the abdominal viscera was found, otherwise all the organs appeared to be normal.—Acting Assistant Surgeon J. B. Young.

Case 634.—John B. Melton, citizen of Missouri; admitted December 4, 1864. Diarrhœa. Died, December 8th. *Autopsy* fifteen minutes after death: Body considerably emaciated. Both lungs were somewhat emphysematous. The pericardium contained twelve ounces of turbid yellowish serum. The heart was rather small, very flaccid, its walls thin, the valves healthy. The liver, spleen and kidneys were normal. The stomach was distended. The mucous coat of the small intestine was congested and the solitary glands enlarged; that of the colon was highly congested and all the coats considerably thickened. The rectum was ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. E. Brooke.

Case 635.—William J. Ferrill, citizen of Missouri; admitted December 1, 1864. Diarrhœa. Died, December 9th. *Autopsy* four hours after death: Body emaciated and jaundiced. Both lungs were hepatized gray; in the right lung several vomicæ were found. The gall-bladder contained three ounces of dark thick bile resembling tar. The mesenteric glands were enlarged. The mucous coat of the rectum was highly congested.—Acting Assistant Surgeon J. M. Witherwax.

Case 636.—Thomas Cook, a citizen of Missouri; admitted December 8, 1864. Diarrhœa. Died, December 9th. *Autopsy* two hours after death: Body much emaciated. The lungs were normal. The pericardium contained four ounces of straw-colored serum. The liver and spleen were unnaturally firm, the latter five times its normal size; the gall-bladder contained two ounces of black tar-like bile. The mucous membrane of the stomach was slightly congested; that of the duodenum and of a large portion of the small intestine more decidedly so; the solitary glands were enlarged. There was an intussusception in the lower third of the small intestine. The colon was highly congested. The rectum was softened and ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. E. Brooke.

Case 637.—Isaiah H. Jackson; age 72; admitted November 26, 1864. Diarrhœa. This man was taken prisoner October 26th, and soon after was attacked with diarrhœa, which at first was rather dysenteric in character. He improved under treatment after admission until December 5th, when a relapse occurred, the stools became involuntary, and he died December 10th. While in hospital he was restive, dispirited, and seemed to think every one his personal enemy. The treatment was chiefly tonic and stimulant. *Autopsy* twelve hours after death: The thoracic viscera were normal. The mucous membrane of the small intestine was thickened and softened; that of the large intestine extensively ulcerated. The liver and spleen were softened; the kidneys abnormally hard.—Acting Assistant Surgeon J. B. Young.

Case 638.—Private Charles Urlks, company H, 17th Alabama; admitted December 10, 1864. Chronic diarrhœa and scurvy. Died, December 11th. *Autopsy* twenty-four hours after death: The lungs contained an excess of black pigment. The right auricle of the heart was adherent to the pericardium. The liver was normal; the gall-bladder contained a small calculus. The small intestine was congested. The mucous membrane of the rectum was softened and ulcerated. The inner side of the left leg from the thigh to the ankle was purplish, and on being cut into the tissue beneath the discolored portion appeared to be disorganized.—Acting Assistant Surgeon J. E. Brooke.

Case 639.—James B. Harman, born in Missouri; age 16; admitted December 7, 1864. Typhoid pneumonia. This lad, who was a deserter from the rebel army, into which he had been conscripted, had long been subject to frequent attacks of fever and ague. He was attacked with diarrhœa about the 19th of November, and on the 4th of December with pain in the left side and cough. When received into the hospital he still had diarrhœa. His tongue was coated with brown fur; pulse 100;

respiration hurried; pain in the left side; anorexia; thirst. The left side was dull on percussion, and on auscultation crepitant and sibilant rales could be heard. Ordered turpentine emulsion and low diet. December 8th: Is worse; the diarrhœa continues. R. Dover's powder eighteen grains, bismuth eighteen grains, sulphate of quinia twelve grains; make six powders. Take one every four hours. December 10th: Was delirious last night, and is so yet; vomits bilious matter. Died, December 11th. *Autopsy* twelve hours after death: The upper lobe of the left lung and the lower lobe of the right were hepatized. Pleuritic adhesions existed on both sides. The liver appeared to be normal; the gall-bladder was distended with bile. There was an intussusception in the small intestine. The mucous membrane of the small intestine was congested, the solitary follicles enlarged. The mucous membrane of the rectum was inflamed and softened. The mesenteric glands were enlarged.—Acting Assistant Surgeon H. C. Newkirk.

CASE 640.—Corporal John B. Cason, company E, 3d Florida; age 22; admitted September 20, 1864. Diarrhœa. This man enlisted in the rebel army April 15, 1861. His health previously was good. He was sent to hospital four different times with diarrhœa before being captured at Daysville, Georgia, May 18, 1864. After his capture he was sent to Rock Island prison. He was then suffering with diarrhœa, and was twice transferred from the barracks to the hospital before his final admission, September 20th. Besides the diarrhœa he had scorbutic symptoms, for which citric acid and vegetable diet were administered without effect. He died December 12th. *Autopsy* twenty hours after death: The lower limbs were œdematous and discolored; the gums in a sloughing condition. The mucous membrane of the intestines was congested and ulcerated.—Acting Assistant Surgeon J. B. Young.

CASE 641.—Private Ira G. Cobb, company A, 1st Arkansas cavalry; admitted November 8, 1864. Chronic diarrhœa. December 13th he was transferred to ward M with well-marked erysipelas [of the face?]. Scorbutic patches were observed on his feet and ankles. He died December 14th. *Autopsy* twenty-four hours after death: The large intestine was much ulcerated, particularly the rectum. No other lesions of importance were noted in the other abdominal or thoracic viscera. [The brain was not examined.]—Acting Assistant Surgeon Washington Matthews.

CASE 642.—Private Augustus Allen, company K, 1st Arkansas cavalry; age 36; admitted December 11, 1864. Dysentery. This man stated that he had been sick most of the time for the last year with diarrhœa, bronchitis and pneumonia. When admitted he was extremely feeble and his pulse scarcely perceptible. He had some cough, with scanty expectoration and frequent watery stools. Treatment: Quinine, opium, whiskey, &c. Died, December 16th. *Autopsy* twenty-four hours after death: There were a few tubercles in the right lung, but otherwise the lungs appeared to be normal. The right cavities of the heart contained a fibrinous clot. The intestinal mucous membrane was softened and easily scraped off. The mesenteric glands were enlarged.—Acting Assistant Surgeon H. H. Russell.

CASE 643.—John Allega; age 33; admitted December 6, 1864. Chronic diarrhœa. This man stated that he was conscripted October 25th, by a band of bushwhackers calling themselves "Mountain Hessians," who robbed him of everything, treated him very brutally, and at length turned him loose almost naked and without food. He lay for sixteen days in the mountains almost without food, and during this time was attacked with acute dysentery. He delivered himself up November 8th, and was detained as a prisoner. When admitted to hospital his disease had assumed the character of chronic diarrhœa, and he was greatly emaciated. December 18th, he was attacked with erysipelas of the face, commencing at the nose. Died, December 20th. *Autopsy* six hours after death: There were extensive pleuritic adhesions on the right side, and the left lung was adherent to the diaphragm; the lung-tissue was normal. The colon and rectum were much ulcerated. The other viscera were normal.—Acting Assistant Surgeon Washington Matthews.

CASE 644.—Private George W. Warren, company F, 24th Mississippi; age 24; admitted March 13, 1864. Consumption. This man enlisted in the rebel army in September, 1861. He had measles the winter after enlistment, and was subsequently troubled with cough and diarrhœa. He was hardly ever fit for duty. Was captured November 24, 1863, and committed to Rock Island prison December 5th; next day he was transferred to hospital and found to be suffering from pneumonia. From this he recovered, and was thought well enough to be returned to the barracks March 1, 1864. He, however, again took cold, and was returned to hospital on the 13th with a severe cough and diarrhœa. Was first seen by the reporter December 15, 1864. He was then extremely feeble, had a severe cough, copious expectoration and very troublesome diarrhœa. He had been taking cod-liver oil and milk-punch for some time. Remedies appeared to have but little effect. Died, December 20th, at 2 A. M. *Autopsy* twelve hours after death: Body greatly emaciated. Both lungs contained softened tubercles. The heart was normal; its right auricle contained a large clot. The liver and spleen were congested. The solitary follicles of the small intestine were enlarged. The mucous membrane of the rectum was softened but not ulcerated. The mesenteric glands were enlarged and cheesy.—Acting Assistant Surgeon H. C. Newkirk.

CASE 645.—Private James P. Hampton, of a Missouri regiment; age 18; admitted December 18, 1864. Diarrhœa. This lad enlisted in the rebel army in September, 1861. He had previously enjoyed good health. He was captured in October, and committed to Rock Island prison November 24th. Was taken with diarrhœa about the time of capture, and continued to suffer from it. He took cold December 15th, and had a chill, followed by severe cough and pain in left side, for which he was sent to hospital. When first seen he was dull and listless; his tongue was coated brown; his bowels were loose; pulse 100; respiration hurried; anorexia; thirst. Treatment: Dover's powder, &c., milk-punch, beef-tea. He became delirious, and died December 21st. *Autopsy* twelve hours after death: There were evidences of pleurisy on the left side. The lower lobe of the left lung was congested. There was some effusion of serum into the pericardium. The walls of the heart were thin and flabby. The stomach and intestines were distended with gas. The solitary follicles were ulcerated. The mucous membrane of the rectum was inflamed and softened. The mesenteric glands were enlarged.—Acting Assistant Surgeon H. C. Newkirk.

Case 646.—Benjamin F. Maddox, a citizen of Missouri; admitted December 8, 1864. Chronic diarrhœa. Died, December 21st. *Autopsy* eight hours after death: The lower lobes of both lungs were congested. The heart was normal. The liver was congested. The spleen was normal. Scarcely a trace of the great omentum remained. The colon and rectum were ulcerated.—Acting Assistant Surgeon Washington Matthews.

Case 647.—Private James Brady, company B, Love's Missouri regiment; admitted December 19, 1864. Diarrhœa. This man enlisted in October, 1864, and has been suffering with diarrhœa ever since. He was captured during Price's retreat from Missouri, and sent to Rock Island prison, suffering all the while with diarrhœa. When admitted to hospital the diarrhœa was very severe. He was very feeble, and died December 22d. *Autopsy* fourteen hours after death: There was some effusion of serum into the pleural sacs and the pericardium. The lungs contained tubercles. The walls of the heart were very thin. The liver and spleen were nearly normal. The mucous membrane of the small intestine was congested. The colon and rectum were ulcerated. The mesenteric glands were enormously enlarged and filled with a pus-like fluid.—Acting Assistant Surgeon J. B. Young.

Case 648.—Private James N. Hogan, company G, Gordon's Arkansas regiment; admitted December 17, 1864. Chronic diarrhœa. Died, December 23d. *Autopsy* ten hours after death: The pericardium contained six ounces of serum. The heart, lungs, spleen and liver were normal. The great omentum was completely absorbed. The intestinal mucous membrane was congested, the rectum ulcerated.—Acting Assistant Surgeon Washington Matthews.

Case 649.—Private George Bridges, company K, 11th Arkansas; age 19; admitted December 12, 1864. Chronic diarrhœa. When admitted this man was emaciated and debilitated to a great degree. He was very irritable in temper, and had evidently suffered much from sickness and exposure. He became unsettled in his mind as his weakness became greater. Was troubled continually with a distressing cough and pain in the chest, which was very severe the night previous to his decease. Died, December 25th. *Autopsy* ten hours after death: The lungs were congested, their lower lobes hepatized. The pleuræ were coated with lymph and pus. The mucous membrane of the large intestine was inflamed and ulcerated.—Acting Assistant Surgeon Washington Matthews.

Case 650.—Abraham T. McDaniel, Missouri guerilla; age 23; admitted December 19, 1864. Chronic diarrhœa. This man was conscripted by General Price, deserted and surrendered himself to the United States forces. He was sick with diarrhœa from the time he joined Price's army. When admitted to hospital the disease was in an advanced stage; stools involuntary; tongue brown and dry; pulse feeble, frequent and wiry; dyspnœa; anorexia. The treatment consisted of stimulants, tonics and astringents. Died, December 25th. *Autopsy* eight hours after death: Both lungs were filled with tubercles. The pericardium contained a quantity of serum. The liver was normal; the gall-bladder distended with bile. The mesentery was congested, the mesenteric glands enlarged. The mucous membrane of the descending colon and rectum was ulcerated and broken down.—Acting Assistant Surgeon J. B. Young.

Case 651.—Private J. R. Crow, company I, 36th Alabama; age 35; admitted December 7, 1864. Chronic diarrhœa and consumption. This man had suffered from diarrhœa and cough for several months. When admitted his pulse was small and frequent; tongue dry and brown; skin dry. He died December 26th. *Autopsy* twelve hours after death: Both lungs were full of tubercles, and there were several vomicæ of considerable size; evidences of recent pleurisy were observed on the left side. Large clots were found in both sides of the heart. The mucous membrane of the small intestine was softened; that of the colon and rectum extensively ulcerated.—Acting Assistant Surgeon J. B. Young.

Case 652.—Private Samuel Ford, company B, 7th Missouri; age 35; admitted December 24, 1864. Chronic diarrhœa. This patient was delirious from the time he came into the ward. He had a dry brown tongue, small frequent pulse, dry skin, &c. Died, December 29th. *Autopsy* six hours after death: The lungs appeared to be nearly normal. The pericardium contained a considerable quantity of serum. The intestinal mucous membrane was in a gangrenous condition. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. B. Young.

Case 653.—Private Andrew J. Pope, company A, 31st Alabama. Admitted December 13, 1864. Chronic diarrhœa. This patient was an old "hospital soldier." Previous to his last admission to this hospital he had been here under treatment for œdema of the lower extremities and chronic diarrhœa. The former was cured, or greatly relieved, some four or five months ago, while the latter has been unsuccessfully treated in quarters for over six months with various remedies. The patient had, besides, complained at various times of symptoms which seemed to indicate derangement of the kidneys, and has had a cough with expectoration and thoracic pains for about three weeks. He was transferred to ward M late on the evening of December 29th. He complained of feeling very cold, but was able to sit by the fire. He died early on the following morning. *Autopsy* seven hours after death: The pleuræ, pericardium and peritoneum all showed signs of chronic inflammation, and their cavities contained more or less liquid mixed with ropy purulent deposits. Both lungs were hepatized. The large intestine was extensively ulcerated. The medullary substance of the kidneys was much darker and harder than normal.—Acting Assistant Surgeon Washington Matthews.

Case 654.—Henry Birk, citizen of Virginia; admitted November 21, 1864. Chronic diarrhœa. Died, December 29th. *Autopsy* twelve hours after death: There was recent pleurisy on both sides, and a large quantity of pus adhered to the pleural surfaces. A large abscess was found in the left lung. The mucous membrane of the large intestine was ulcerated. The mesenteric glands were enlarged.—Acting Assistant Surgeon Morris Hale.

Case 655.—Private Henry Goss, company F, 16th Tennessee; admitted December 12, 1864. Chronic diarrhœa and pneumonia. Died, December 31st. *Autopsy* forty-eight hours after death: The right lung was in the stage of gray hepatization.

The pericardium contained twenty ounces of fluid. The small intestine was inflamed; the large intestine ulcerated, particularly the rectum, which was implicated to an extraordinary degree.—Acting Assistant Surgeon H. C. Newkirk.

CASE 656.—Private Barney Morgan, company I, Freeman's Arkansas regiment; admitted December 27, 1864. Acute bronchitis. Died, January 1, 1865. *Autopsy* twelve hours after death: The right lung was hepatized. The right side of the heart contained clots. The liver was normal; the gall-bladder distended with bile. The spleen very much enlarged. The mucous membrane of the small intestine was congested and colored with bile. The colon and rectum were ulcerated.—Acting Assistant Surgeon H. C. Newkirk.

CASE 657.—Private William Riggins, company F, 3d Georgia cavalry; age 36; admitted November 29, 1864. Scurvy. This man was captured at Knoxville, Tennessee, September 29, 1862; was taken to Louisville, Kentucky, and afterward exchanged at Vicksburg, Mississippi. He was captured a second time on the Holston river, in Tennessee, and sent to Rock Island prison. Has been in hospital twice with diarrhœa, and, in fact, has never been well since arriving at this prison. Since his present admission, except, perhaps, during the first few days, he had no diarrhœa, his bowels being rather constipated. The urine was scanty. He complained a good deal of dyspnœa, and had to be propped up in bed much of the time. His abdomen was very much distended and the intercostal spaces were prominent, apparently from effusion into the abdominal and pleural cavities. He died January 3, 1865. *Autopsy* four hours after death: There was considerable effusion in both pleural sacs; the lungs were full of miliary tubercles. The heart was dilated, its walls thin; the right auricle was so dilated as to hold about four ounces; its walls were as thin as paper. The abdomen was distended with serum: the integument stretched and shiny. The viscera were adherent wherever there was contact; the adhesions consisted of a well-developed fibrous tissue. The mesenteric glands were greatly enlarged, varying from the size of a hazel-nut to that of a hulled walnut. The abdominal viscera thus interadherent formed one solid mass weighing about thirty pounds.—Acting Assistant Surgeon J. B. Young. [No. 651, Medical Section, Army Medical Museum, is from this case. The specimen is a perpendicular section through the abdominal viscera, showing the intestines adherent to each other and the mesenteric glands greatly enlarged, the whole forming a solid mass.]

CASE 658.—Private William C. Millican, company A, 2d Texas cavalry; admitted December 21, 1864. Chronic diarrhœa. Died, January 3, 1865. *Autopsy* six hours after death. The lower and posterior portion of the right lung was hepatized, and some of the bronchial tubes contained pus. The left lung was firmly adherent to the walls of the thorax but was healthy in substance. The spleen was four times the normal size. The ileum was invaginated in three distinct places—the highest implicating ten inches of the intestine, the second two inches and a half, the third three-quarters of an inch. The rectum was extensively ulcerated. The descending colon was also ulcerated, but to a less degree. The mesenteric glands were somewhat enlarged.—Acting Assistant Surgeon Washington Matthews.

CASE 659.—Henry Forrest, citizen; admitted December 15, 1864.—Chronic diarrhœa. Died, January 4, 1865. *Autopsy* eight hours after death: Both lungs were adherent, but otherwise healthy. The pericardium contained a small quantity of fluid. The spleen was unusually pale but of normal size. The mucous coat of the stomach presented indications of chronic inflammation and the muscular coat was thickened. The small intestine was a succession of abnormally large pouches alternating with constrictions. The large intestine was extensively ulcerated. The mesenteric glands were much enlarged. No other abnormal appearances were observed.—Acting Assistant Surgeon Washington Matthews.

CASE 660.—Private Leander T. Wells, company G, 16th Georgia cavalry; admitted December 12, 1864. Chronic diarrhœa. This man when admitted had dysenteric symptoms which in the course of a few days degenerated into diarrhœa, the discharges becoming free and copious but without blood. Died, January 5, 1865. *Autopsy* eight hours after death: The lungs contained a few tubercles and were congested posteriorly. The spleen was not more than a third of its natural size. The ileum was invaginated to the extent of twelve inches. The large intestine was extensively ulcerated, the ulceration increasing in severity as it approached the anus. The other organs were normal.—Acting Assistant Surgeon Washington Matthews.

CASE 661.—Private John Mustin, company D, 2d Arkansas; age 18; admitted December 21, 1864. Diarrhœa and typhoid pneumonia. Died, January 6, 1865. *Autopsy* thirty-six hours after death: Both lungs were extensively hepatized. The bronchial tubes contained muco-pus. There was some effusion into the pleural and pericardial cavities, and clots—thrombi—in both sides of the heart. The liver was enlarged and somewhat congested. Both small and large intestines were ulcerated. The stomach showed some indications of chronic inflammation.—Acting Assistant Surgeon Washington Matthews.

CASE 662.—Private Stephen P. Box, company F, 1st Alabama cavalry; age 36; admitted November 5, 1864. Chronic diarrhœa. This man had suffered with diarrhœa for several months, and had been in hospital for treatment a number of times since he was brought to Rock Island. He was very much emaciated when brought into ward 1, and besides severe diarrhœa, had some cough and pain in his chest. These latter symptoms soon subsided; the diarrhœa began to improve; the patient rested well and had a good appetite. He, however, continued to emaciate, and shortly after the first of January, 1865, the diarrhœa became very much worse; he rapidly sank, and died January 8th. *Autopsy* eight hours after death: Both lungs were full of tubercles, which in the left lung had broken down, forming numerous small vomicæ filled with pus; the parenchyma of this lung was so soft as scarcely to allow handling. The mesenteric glands were enlarged. The mucous membrane of the large intestine was softened and ulcerated in large patches.—Acting Assistant Surgeon J. B. Young.

CASE 663.—Private William Judkins, company E, 41st Alabama; admitted October 13, 1864. Chronic diarrhœa and scorbutus. This man was captured at Knoxville, Tennessee, November 1, 1863; arrived at Rock Island January 15, 1864; was soon after sent to hospital suffering with pneumonia and dysentery, from the former of which he recovered; the latter passed into diarrhœa, and he was returned to barracks; growing worse, however, he was sent back to hospital October 13th. At this time he had a dry skin, dry brown tongue, and feeble, frequent pulse. His gums presented evidences of a scorbutic condition. The

evacuations from the bowels were very frequent, and accompanied by tormina and tenesmus. A sustaining treatment was adopted, with citric acid and a chlorate of potash mouth-wash. He died January 9, 1865. *Autopsy* eight hours after death: The lungs contained scattered tubercles; there were pleuritic adhesions on both sides. The pericardium was everywhere firmly adherent to the heart. The mucous membrane of the large intestine was ulcerated. The mesenteric glands were enlarged and disorganized.—Acting Assistant Surgeon J. B. Young.

Case 664.—Private Andrew Winkles, company D, Wood's Missouri battalion; age 22; admitted December 21, 1864. Chronic diarrhœa. This man enlisted in the rebel army March 15, 1863; soon after he was attacked by diarrhœa, and was sick eight months. He then reported for duty on Sabine river in Arkansas; was captured a few days after and sent to Little Rock, where he was confined in the state prison. Here he was taken sick with dysentery, which continued until he was transferred to Rock Island prison. A few days after his arrival here he was sent to hospital and has ever since been most of his time in hospital, the present being his third admission. He has now the symptoms of advanced chronic diarrhœa; his skin is dry and scaly; he is much emaciated; his tongue red, narrow and tremulous. He died January 13, 1865. *Autopsy* ten hours after death: There was some recent pleurisy with formation of pus on the surface of the right pleura. The left lung and the heart were normal. The mesenteric glands were enlarged. The mucous membrane of the large intestine was thickened and softened. In the colon and rectum there were numerous black warty growths [?] as large as hazel-nuts, which seemed hard, and were so numerous as to almost obliterate the tube.—Acting Assistant Surgeon J. B. Young.

Case 665.—William Hall, citizen of Missouri; admitted January 13, 1865. Chronic diarrhœa and erysipelas. This man had suffered for a long time before admission with chronic diarrhœa. When admitted he was exceedingly weak, emaciated, and had an erysipelatous swelling of the left leg extending completely to the knee. The cuticle was raised by a number of blisters varying in size from an inch to three and a half inches in diameter; the entire foot and most of the leg were covered by these blisters; the limb was very much swollen, and its surface in many places of a dark-purple color. The patient was delirious and could not be made to take nourishment. Ordered half a grain of sulphate of morphia in two powders, to be taken three hours apart. He remained under the influence of this narcotic nearly all night. January 14th: To take fifteen drops of muriated tincture of iron and four grains of sulphate of quinia three times a day, alternating with a mixture containing tincture of gentian, capsicum and ginger. A solution of acetate of lead to be applied to the leg. During the day the delirium entirely subsided and the patient had some appetite, but he appeared to be losing sensation in the limb, the skin of which was easily abraded, and there exuded a copious discharge of thin, fetid, sanguineous fluid. Applied a solution of nitrate of silver, one scruple to the ounce of water, to the surface of the limb. January 15th: Substituted a solution of bromine for the nitrate of silver. Milk and soup diet. Black and yellow spots have appeared on the diseased limb. The patient is much weaker. He refuses solid food, but will drink milk, soup, &c. Sleeps well and is quite rational. January 16th: The limb is evidently gangrenous, and the patient died at 4.30 P. M. *Autopsy* twenty hours after death: The mucous membrane of the large intestine was much ulcerated. In the small intestine there was an intussusception involving about twelve inches of the intestine. All the other organs were normal.—Acting Assistant Surgeon Washington Matthews.

Case 666.—Private Richard Roland, company K, 38th Alabama; admitted December 19, 1864. Chronic diarrhœa. This man was a Creek Indian. He had confluent small-pox in the winter of 1863–'4, and has been in poor health ever since. Much of the time he has had diarrhœa and is greatly emaciated. Died, January 20, 1865. *Autopsy* twelve hours after death: Both lungs were filled with miliary tubercles, and there was some effusion in both pleural sacs. The heart was normal. The knuckles of intestine and all the abdominal viscera were firmly bound together by fibrinous adhesions. The liver was unusually pale. [There is no record of the condition of the intestinal mucous membrane.]—Acting Assistant Surgeon J. B. Young.

Case 667.—Private Samuel Divins, company A, 9th Tennessee cavalry; age 23; admitted December 21, 1864. Chronic diarrhœa. This man when admitted was very much emaciated, and had severe scorbutic symptoms besides diarrhœa. His appetite was poor; his skin scaly; and he could scarcely protrude his tongue, which was narrow and red. Treatment: Citric acid, chlorate of potassa, persulphate of iron and vegetable diet. Died, January 21st. *Autopsy* twelve hours after death: There were very extensive pleuritic adhesions on both sides and both lungs were full of miliary tubercles. All the abdominal viscera were firmly interadherent and the adhesions were thickly studded with tubercles. The intestines themselves were green and rotten.—Acting Assistant Surgeon J. B. Young.

Case 668.—Private Young C. Rogers, company B, Carlton's Arkansas regiment; age 36; admitted December 24, 1864. Chronic diarrhœa. This man was transferred to Rock Island barracks November 24th, and has had diarrhœa ever since. When admitted, besides the usual symptoms of diarrhœa he had a cough, expectoration, and pain in the left side of the chest; tongue red; pulse 90; appetite tolerably good. ℞. Nitrate of silver two grains, opium and capsicum each six grains; make eight pills. Take one three times a day. Milk diet. January 1, 1865: Add a cough mixture. January 21st: The patient, who up to this time seemed to be doing very well, was suddenly seized with a severe pain in the small of the back. A blister was applied, but the pain became more severe, and he died January 23d. *Autopsy:* Pleuritic adhesions were found on the right side. The gall-bladder was distended with bile. The substance of the kidneys was inflamed [?]. The mucous membrane of the bowels was congested.—Acting Assistant Surgeon H. C. Newkirk.

Case 669.—Private David A. Gray, Baker's Missouri regiment; admitted January 22, 1865. Dysentery and pneumonia. This man enlisted in the rebel army in September, 1861; deserted in October, and was committed to Rock Island prison in November. His health then was tolerably good. He caught cold January 18, 1865, and was sent to hospital two days after. When admitted he had cough and fever; his tongue was coated and very dry; he had diarrhœa; pulse 100 and very feeble: there was but little expectoration. He complained of soreness in the left breast; on that side there was dulness on percussion, and mucous rale. ℞. Rochelle salt six drachms, opium six grains; make six powders. Take one every four hours. Whiskey

four ounces. Died, January 23d. *Autopsy* twelve hours after death: The lower lobe of the left lung was hepatized and its surface coated with lymph. The liver was congested and soft. The intestinal mucous membrane was congested. The rectum was ulcerated.—Acting Assistant Surgeon H. C. Newkirk.

CASE 670.—Private Richard Sparkman, company B, 10th Kentucky; admitted November 24, 1864. Chronic diarrhœa. At first the following was prescribed: R. Sulphate of magnesia one drachm, opium one grain; make four powders. Take one every six hours. Subsequently nitrate of silver and opium were employed, and during the last week of his illness five drops of creasote were given every morning. Stimulants and nutritious food were liberally administered throughout. Died, January 24, 1865. *Autopsy* twelve hours after death: Body much emaciated. The apex of the left lung contained a large number of tubercles, and tubercles were sparingly scattered throughout the remainder of the lung-tissue on both sides; the middle lobe of the right lung was hepatized. The liver was much enlarged. The rectum was extensively ulcerated. No other abnormities were observed.—Acting Assistant Surgeon N. B. Matthews.

CASE 671.—John W. Agan, Missouri conscript; admitted January 20, 1865. Chronic diarrhœa. This patient had frequent purulent stools, accompanied by much griping pain and some tenderness over the abdomen. Prescribed a creasote mixture. January 23d: Seems better. The discharges are somewhat checked. Ordered blue mass and opium pills morning and evening, and during the day the following: R. Rhubarb twelve grains, tannic acid twelve grains, opium two grains; make six powders. Take one every three hours. Under this treatment the patient was apparently doing well, but January 25th he died suddenly. *Autopsy:* The lower lobe of the left lung was hepatized. The pericardium contained about ten ounces of fluid. The liver was congested and very dark colored. The spleen was normal. The mesenteric glands were enlarged. In the small intestine there were two intussusceptions, each about eight inches in length. The large intestine was generally congested; the rectum very much ulcerated.—Acting Assistant Surgeon H. F. Salter.

CASE 672.—Private Alfred Driskell, company B, 38th Alabama; age 34; admitted January 9, 1865. Typhoid pneumonia. This man enlisted in the rebel army November, 1862; was troubled a good deal with diarrhœa and cough, so that he was seldom able to do duty. He was captured November, 1863, and sent to Rock Island prison in December. Since then he has been in hospital most of the time with chronic diarrhœa. He had an attack of pneumonia in August, 1864. January 8, 1865, he again caught a severe cold, and was next day once more transferred to hospital. He had at that time a severe cough, fever and pain in the side; his tongue was coated brown in the centre, its margins were red; his pulse was 120; respiration somewhat hurried. He had diarrhœa; but little appetite, and some thirst. He was treated with muriate of ammonia and nitrate of potash, sulphate of cinchona, turpentine emulsion, stimulants, &c. Milk diet. Died, January 26th. *Autopsy* twelve hours after death: Body greatly emaciated. The right lung was hepatized and contained an abscess; there were strong pleuritic adhesions on both sides, and the pleural cavities were partly filled with serum and pus. The liver was congested and softened. The mucous membrane of the intestinal tube was congested; that of the rectum inflamed and softened.—Acting Assistant Surgeon H. C. Newkirk.

CASE 673.—James Suggs, a citizen of Missouri; admitted January 22, 1865. Anasarca. Died, January 28th, of pleuro-pneumonia. *Autopsy* thirteen hours after death: There were pleuritic adhesions on the right side, and the right lung was pneumonified. The left lung was congested and slightly adherent. Both pleural sacs contained serum, in all twenty-four ounces. There was some slight pericarditis. The heart contained clots. The liver was normal. The spleen was enlarged. There were two intussusceptions in the small intestine. The lower part of the ileum was inflamed and ulcerated. The colon and rectum were also ulcerated.—Acting Assistant Surgeon J. E. Brooke.

CASE 674.—Private William K. Sinks, company E, 12th Tennessee cavalry; age 30; admitted October 21, 1864. Chronic diarrhœa. Was transferred to ward I about December 25th, when he was first seen by the reporter. He was then very much emaciated and extremely feeble; his skin was dry and covered with scales; the stools were very frequent. He was constantly crying and fretting about home; nothing that could be done diverted his mind from his family and his apprehension of a fatal result. He gradually sank; the stools became involuntary, and he died January 28, 1865. *Autopsy* four hours after death: Both lungs were full of tubercles, some of which had softened, forming minute vomicæ. The heart was normal. The liver and spleen were somewhat congested. The mucous membrane of the large intestine was thickened, softened and ulcerated in spots. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. B. Young.

CASE 675.—Private Robert Renfrew, company B, 2d Cherokee regiment; admitted January 2, 1865. Chronic diarrhœa and remittent fever. Died, January 30th. *Autopsy* two hours after death: Body extremely emaciated. The thoracic viscera were normal, with the exception of slight pleuritic adhesions on the right side. The liver and spleen were normal. The mesenteric glands were enlarged. The descending colon and rectum were thickened and ulcerated.—Acting Assistant Surgeon J. M. Witherwax.

CASE 676.—Private James Hutchens, company H, Coffin's Missouri regiment; admitted January 6, 1865. Diarrhœa. There is no record of this case, except that the patient had been under treatment for diarrhœa until he was admitted to the erysipelas ward the day of his death. He then seemed very weak, but was able to sit up. He was suffering from dyspnœa and expectorated with difficulty. There was dulness on percussion over the right side of the thorax; his abdomen was tympanitic and tender on pressure; a bluish congested appearance was observed about the occipital region and over the mastoid process, (this continued after death,) and there was a diffused erysipelatous blush over the whole chest. A few hours after his admission to the erysipelas ward he was seized with a paroxysm of dyspnœa, apparently due to a sudden accumulation of mucus in the bronchial tubes, and died in a few minutes, February 1st. *Autopsy* twenty hours after death: The pericardium contained eight ounces of serum. The heart was normal in structure and size; it contained fibrinous clots weighing about three ounces. There

were old pleuritic adhesions on the left side, but the left lung was normal; the right pleural sac contained about two ounces of sero-purulent fluid; the right lung was completely hepatized, coated with recent lymph, and presented at its apex some large tubercles and several cavities filled with pus. The intestines were distended with gas. The colon was congested and the rectum ulcerated, but neither to the great degree so often witnessed. No other abnormities were observed.—Acting Assistant Surgeon Washington Matthews.

Case 677.—James M. Leach, Missouri conscript; age 25; admitted January 27, 1865. Dysentery. This man stated that he was taken sick with a severe cold some time before his admission, and that the cold was followed by dysentery. At the time of admission he had from fifteen to eighteen bloody slimy discharges from the bowels in the twenty-four hours, and severe griping pain in the lower part of the abdomen; he had considerable thirst; his countenance was pale and sallow; he experienced a good deal of pain in urinating; the pulse was 75 and small; the tongue coated yellow; the skin dry and rough. Ordered five grains of blue mass and one of opium, to be taken at once, afterward a mixture containing creasote. Milk diet. January 28th: Treatment continued. January 31st: The symptoms continue unabated. He passes much blood. ℞. Blue mass twenty grains, Dover's powder twenty grains; make four pills. Take one every four hours. Enemata of acetate of lead and laudanum. February 1st: Continue treatment. Died, February 2d. *Autopsy* the same day: The pericardium contained eight ounces of serum. The left lung was hepatized. The liver was healthy; the gall-bladder distended with bile. The spleen was larger than normal. The mesenteric glands were much enlarged. There were two intussusceptions in the small intestine. The rectum was much ulcerated.—Acting Assistant Surgeon H. F. Salter.

Case 678.—Alfred Gagen, a citizen of Missouri; admitted January 3, 1865. Chronic diarrhœa. There is no record of the history of this patient until January 30th, when he was transferred to the erysipelas ward. He was then much emaciated; his voice was weak. He had a slight erysipelatous inflammation under the left eye; the pulse was feeble; the stools frequent and copious. There was some dulness on percussion over the lower part of the right lung posteriorly, and considerable dulness over the entire left lung. On succussion a splashing sound was heard at the third intercostal space. He was treated with stimulants and a blister was applied to the left side of the chest. February 4th: He woke up feeling better, but, after conversing in a lively manner for a few moments, lay quietly back and died without a struggle. *Autopsy* four hours after death: The pericardium contained six ounces of sero-purulent matter. The right pleural sac contained two quarts of a similar fluid. There was a clot, an ounce in weight, in the right auricle extending into the ventricle. A limited portion of the base of the right lung was hepatized. The rectum was ulcerated. No other abnormities were observed.—Acting Assistant Surgeon Washington Matthews.

Case 679.—William S. Clay; age 29; admitted February 1, 1865. Acute diarrhœa. This man was first taken sick with a severe cold, and diarrhœa followed. He had from ten to twelve passages daily, with severe tormina. The stools consisted of blood and slime. When admitted his countenance was shrunken and pale; tongue dry and coated with a yellow fur; skin soft; pulse 75. He had considerable thirst but no appetite. He was also troubled with a constant cough and pain in the chest. ℞. Rhubarb six grains, tannin nine grains, opium two grains; make three powders. Take one every three hours. A sinapism to the abdomen. Milk diet. February 2d: Continue treatment, with ten grains of Dover's powder at night. February 3d: Milk-punch. February 4th: The patient is no better. He complains also of a dull heavy pain in the chest. There is dulness on percussion below the nipple on both sides. ℞. Blue pill twenty grains, acetate of lead twelve grains, opium two grains; make four pills. Take one every three hours. Died, February 6th. *Autopsy* the same day: Both auricles of the heart contained fibrinous clots. Both lungs were hepatized. The liver and spleen were healthy. The mucous membrane of the small intestine was congested; that of the large intestine congested and extensively ulcerated. The mesenteric glands were very large.—Acting Assistant Surgeon H. F. Salter.

Case 680.—Private S. Terrill, company D, 4th Alabama cavalry; admitted January 13, 1865. Chronic diarrhœa. When seen next day the patient was much debilitated, had no appetite, and, besides a profuse diarrhœa, complained of a painful swelling of the right cervical lymphatic glands. Ordered tincture of iodine to be applied to the swelling twice daily and the following: ℞. Tannic acid twelve grains, opium and camphor of each three grains; make six powders. Take one every four hours. This treatment was continued for the next week. January 21st: His appetite and general condition is improving, but the swelling has increased. The iodine was discontinued and a flaxseed poultice applied. January 22d: Complains of loss of sleep. Stopped the former powders, and ordered three grains of Dover's powder to be taken every three hours. This was continued until January 30th. February 1st: Substituted the following: ℞. Sulphate of quinia twelve grains, Dover's powder fifteen grains; make three powders. Take one every four hours. This was continued until February 5th, when the abscess was opened, discharging copiously. The wound was washed twice daily and a simple dressing applied. February 8th: Facial erysipelas made its appearance, for which tincture of iodine was applied, and twenty drops of the tincture of the chloride of iron given internally three times daily. The erysipelas subsided, but the integument about the orifice of the abscess of the neck speedily sloughed, forming a phagedenic ulcer of considerable size. Meanwhile the diarrhœa grew constantly worse; the pulse became rapid and feeble; sordes collected on the teeth and lips; and the patient died February 17th. *Autopsy* seven hours after death: Body much emaciated. The ulcer on the right side of the neck had extended until it was about four inches and a half in diameter, laid bare the muscles of the neck, dissected between them, and nearly communicated with the pleural cavity of the right side, as was shown by the fact that a dark stain, caused by an application of persulphate of iron shortly before death, had penetrated to the apex of the right lung, which was strongly adherent. The second and third portions of the subclavian artery and part of its first portion were quite denuded of the surrounding tissue. An old fracture of the right clavicle was also observed. The pericardium contained four ounces of fluid. There was an intussusception in the ileum. The descending colon and rectum were ulcerated. The mesenteric glands were enlarged. No other abnormities were observed.—Acting Assistant Surgeon Washington Matthews.

CASE 681.—Thomas Monahan, a citizen of Missouri; admitted January 7, 1865. Diarrhœa. While under treatment this man had a slight attack of facial erysipelas, which, however, only involved a patch of about three inches in diameter. Subsequently he complained of a swelling in his left knee, which on examination proved to be a small abscess. This was opened February 15th, and discharged two ounces of bloody pus. The abscess was surrounded by ten small but unhealthy-looking ulcers. Scorbutic stains were observed on both lower extremities. The patient now had rigors and febrile paroxysms daily, and died February 18th. *Autopsy* eight hours after death: Body much emaciated. The brain-substance was soft, but otherwise perfectly normal. There were old pleuritic adhesions on the right side. The left pleural cavity contained twelve ounces of serum. The lower lobe of the left lung was hepatized. The pericardium contained a pint of fluid. There was more or less congestion of the whole intestinal mucous membrane, and some ulceration of the rectum. The other abdominal organs appeared to be healthy.—Acting Assistant Surgeon Washington Matthews.

CASE 682.—George Hill, Missouri volunteer; admitted December 6, 1864. Chronic dysentery. Died, March 6, 1865. *Autopsy* two hours after death: Body much emaciated. The thoracic viscera were normal. Nothing abnormal was observed in the liver, spleen or stomach. The mucous membrane of the ileum was inflamed; that of the cæcum and lower part of the colon was inflamed and softened. The rectum was gangrenous. The mesenteric glands were enlarged.—Acting Assistant Surgeon J. M. Witherwax.

The next two cases were forwarded, with the specimens, from the HARVEY HOSPITAL, Madison, Wisconsin, Surgeon Howard Culbertson, U. S. V., in charge:

CASE 683.—Private Charles Collier, company A, 8th Wisconsin volunteers; admitted March 18, 1864. Chronic diarrhœa. [This man appears on the hospital register of his regiment, then at Oxford, Mississippi, admitted December 15, 1862—catarrh—returned to duty January 17, 1863. He again appears on the hospital register of the regiment, then at Big Black, Mississippi, admitted September 14th—dropsy—sent to general hospital October 10th. He is borne on the register of hospital No. 1, Vicksburg, Mississippi, admitted October 10th—rheumatism—transferred to the Invalid Corps October 21st; and on the register of hospital No. 2, Vicksburg, admitted October 26th—chronic dysentery.] Died, July 15th, after an attack resembling ileus, which lasted thirty-six hours. The symptoms were great pain, obstinate vomiting, early prostration, constipation, and great distention of the abdomen by flatus. The treatment consisted in the use of anodynes.—Surgeon Howard Culbertson, U. S. V. [No. 505, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the mesentery in which an opening has been formed through which several feet of the lower part of the ileum passed and subsequently became strangulated. When received at the Museum the cavity of the strangulated intestine was found to be full of clotted blood. The laminæ of the portion of mesentery belonging to the strangulated intestine were separated by hemorrhagic extravasation, and the whole peritoneal surface of the intestine was dark from the engorged condition of the vessels.]

CASE 684.—Private Uri Probst, company F, 25th Wisconsin volunteers; age 45; admitted July 12, 1861. Chronic rheumatism. [This man appears on the register of hospital No. 1, Nashville, Tennessee, admitted June 13th, from Chattanooga—inflammatory rheumatism—sent to Louisville June 16th. He appears on the register of Jefferson hospital, Jeffersonville, Indiana, admitted June 16th—chronic rheumatism—sent to St. Louis June 29th. He appears on the register of Jefferson Barracks, St. Louis, Missouri, admitted July 5th, from hospital steamer J. F. Ford—chronic rheumatism—sent to Madison, Wisconsin, July 12th.] Died, August 1st, of inflammation of the bowels.—Surgeon Howard Culbertson, U. S. V. [No. 495, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the transverse colon, which is thickened, softened, and presents numerous excavating ulcers which penetrate to the muscular coat.]

The notes of the next case were forwarded, with the specimen, from the POST HOSPITAL, Rolla, Missouri, Surgeon Howard Culbertson, U. S. V., in charge:

CASE 685.—Private August Mere, company A, 9th Missouri cavalry; admitted November 11, 1862. Chronic diarrhœa. Had been sick for the last six months. Treatment: Anodynes, astringents, alteratives and tonics. Died, February 1, 1863. *Autopsy:* The mucous membrane of the entire colon and rectum was thickened and ulcerated; at points the muscular coat was penetrated.—Surgeon Howard Culbertson, U. S. V. [No. 184, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the descending colon, the mucous membrane of which is thickened, plastered with pseudomembrane, and presents a number of irregular ulcers.]

The next two cases are from the case-book of LAWSON HOSPITAL, St. Louis, Missouri, Surgeon C. T. Alexander, U. S. A., in charge:

CASE 686.—Private George Stoute, company D, 67th Indiana volunteers; age 31; admitted from hospital steamer City of Memphis February 22, 1863. Diarrhœa. This man had been sick since September 17, 1862, when he had an attack of intermittent fever. Died, March 16th. *Autopsy:* The rectum was very much ulcerated, and there was an intussusception in the small intestine, which, however, produced no symptoms during life.

CASE 687.—Private Leander Martin, company C, 31st Missouri volunteers; admitted, per hospital steamer D. A. January, from hospital steamer Nashville, Milliken's Bend, Louisiana, March 21, 1863. Diarrhœa. The patient stated that he had been sick two months. He was much emaciated, his tongue coated brown, and he complained a great deal of nausea. Lime-water and milk seemed to be the most efficacious remedy for the latter trouble, but for several days after admission his stomach would tolerate no solid food. Toward the close of the month of March his stomach became less irritable, but the diarrhœa continued;

he became low spirited, and finally sank into a typhoid condition. April 6th: He had a distinct chill, and afterward grew rapidly worse, and died April 8th. *Autopsy:* No lesion of importance was discovered except in the large intestine, the mucous membrane of which was very much congested, thickened, and presented a number of minute ulcers.

The next twenty cases were forwarded on medical descriptive lists from the CITY HOSPITAL, St. Louis, Missouri, Surgeon John T. Hodgen, U. S. V., in charge:

CASE 688.—Private William L. Brigandini, company A, 32d Missouri volunteers; age 31; admitted, per hospital steamer City of Memphis, from Milliken's Bend, Louisiana, May 10, 1863. Chronic diarrhœa. The patient was feeble, emaciated, and had from four to six stools daily. Treatment: Stimulants and astringents. Died, May 14th. *Autopsy:* There were old pleuritic adhesions on the right side and an unusual amount of fat on the surface of the heart. The mucous membrane of the ileum was thickened, softened and congested; that of the colon was thickened, softened and ulcerated. The kidneys were enlarged and granular; the two weighed seventeen ounces.—Acting Assistant Surgeon Stephen R. Gay.

CASE 689.—Private William McDowell, company I, 56th Ohio volunteers; age 27; admitted from Milliken's Bend, Louisiana, per hospital steamer City of Memphis, May 10, 1863. Chronic diarrhœa. The patient suffered also from a bronchial complication, for which syrup of squill and morphia were used occasionally; the general treatment consisted in the free use of infusion of helianthemum, and the following powders three times daily or as required. ℞. Aromatic powder two scruples, bismuth one drachm, tannic acid one scruple, Dover's powder half a drachm; make twenty powders. Diet: Bread and milk, soup, wine. May 12th: Substituted a turpentine emulsion containing morphia for the powders. Died, May 14th. *Autopsy:* Body greatly emaciated. The heart was enlarged and fatty. The lungs were emphysematous. The mucous membrane of the ileum was congested; that of the large intestine was softened. The kidneys were large and soft.—Acting Assistant Surgeon Wm. A. McMurray.

CASE 690.—Private Reuben Winser, company F, 32d Missouri volunteers; age 24; admitted from Milliken's Bend, Louisiana, per hospital steamer City of Memphis, May 14, 1863. Chronic diarrhœa. The patient was moribund when admitted, much emaciated, and unable to articulate. Died, May 15th. *Autopsy:* There were old pleuritic adhesions on both sides and tubercles in the right lung. The mucous membrane of the large intestine was much softened. The kidneys were enlarged and softened.—Acting Assistant Surgeon Wm. A. McMurray.

CASE 691.—Private W. E. Shameer, company K, 30th Missouri volunteers; age 25; admitted May 14, 1863. Chronic diarrhœa. The patient was much emaciated, and died next day. *Autopsy:* There were some pleuritic adhesions. The ileum and large intestine were ulcerated. The kidneys were large.—Acting Assistant Surgeon Wm. A. McMurray.

CASE 692.—Private Gottlieb Wittler, company G, 83d Indiana volunteers; age 35; admitted May 14, 1863. Chronic diarrhœa. Treatment: Nitrate of silver pills; whiskey. Died, May 16th. *Autopsy:* The right lung presented evidences of lobular pneumonia. The liver was soft and fatty. The ileum was intensely congested, and the mucous membrane of the colon was softened. The right kidney was also softened.—Acting Assistant Surgeon Stephen R. Gay.

CASE 693.—Private Morris Chaplin, company E, 99th Illinois volunteers; age 34; admitted from Milliken's Bend, Louisiana, per hospital steamer City of Memphis, May 10, 1863. Chronic diarrhœa. Was taken ill at Helena, Arkansas, April 5th. When admitted the patient was very weak; his tongue dry and coated; appetite poor; pulse 90 and feeble. He had twelve to fourteen stools a day. To take powders containing a grain each of acetate of lead and opium twice daily, and a teaspoonful of tincture of arnica three times a day. Died, May 16th. *Autopsy:* There were pleuritic adhesions at the apex of the right lung and miliary tubercles in its upper lobe; in the middle lobe of the same lung there was a tubercle as large as a filbert. The mucous membrane of the whole large intestine was thickened and softened; in the descending colon and rectum it was ulcerated. The left kidney contained a cyst holding about a drachm of fluid.—Acting Assistant Surgeon Oscar Blank.

CASE 694.—Private J. W. Thompson, company D, 3d Illinois cavalry; age 23; admitted from Milliken's Bend, Louisiana, per hospital steamer City of Memphis, May 10, 1863. Chronic diarrhœa. Was taken ill January 15th, at Vicksburg, Mississippi. When admitted he was very feeble; had no appetite; the stools were frequent and fluid. He had cough and purulent sputa. Treatment: Acetate of lead and opium; special diet; wine. Died, May 16th. *Autopsy:* There were old pleuritic adhesions on the right side. The pericardium contained four ounces of serum. The heart was normal. The mucous membrane of the colon was thickened and softened.—Acting Assistant Surgeon Oscar Blank.

CASE 695.—Private M. Hole, company F, 20th Ohio volunteers; admitted from Milliken's Bend, Louisiana, per hospital steamer City of Memphis, May 10, 1863. Diarrhœa. When admitted he complained of severe pain in the abdomen and had frequent stools. Treatment: Astringents, stimulants, half diet. Died, May 17th. *Autopsy:* There were recent pleuritic adhesions on both sides. The lower lobe of the right lung was much congested. The mucous membrane of the colon was inflamed and ulcerated.—Acting Assistant Surgeon J. C. Shattuck.

CASE 696.—Private Michael McElroy, company B, 32d Missouri volunteers; age 45; admitted from Milliken's Bend, Louisiana, per hospital steamer City of Memphis, May 10, 1863. Chronic diarrhœa. The patient had typhoid symptoms and anasarca. Ordered him to drink infusion of helianthemum. Diet: Milk, soup, toddy, &c. May 13th: Turpentine emulsion containing morphia. The diarrhœa, however, continued; bilious vomiting set in, and he died May 17th. *Autopsy:* the liver was fatty. The mucous membrane of the large intestine was softened and ulcerated. The kidneys were softened.—Acting Assistant Surgeon Wm. A. McMurray.

CASE 697.—Private Frederick Miller, company C, 58th Ohio volunteers; age 33; admitted from Milliken's Bend, Louisiana, per hospital steamer City of Memphis, May 10, 1863. Chronic diarrhœa. The patient was very much emaciated. Ordered infusion of helianthemum, and powders containing tannic acid and Dover's powder; stimulants were also used freely; milk diet. The patient had a ravenous appetite and tried all means to indulge it. Died, May 17th. *Autopsy:* There were old pericardial adhesions, but the heart was normal. The right pleural sac contained a large quantity of serum. There were patches of ecchymosis in the duodenum and the upper part of the jejunum, and small circumscribed ulcers with raised edges in the lower part of the colon. A supernumerary spleen, about as large as a filbert, was found attached to the great omentum near the left end of the stomach. Both kidneys were congested and granular, the left being more diseased than the right.—Acting Assistant Surgeon Wm. A. McMurray.

CASE 698.—Private E. L. Brown, company B, 108th Illinois volunteers; age 25; admitted from hospital steamer City of Memphis May 10, 1863. Chronic diarrhœa. This man was taken ill in January, at Arkansas post, Arkansas. When admitted he was very weak, his appetite poor, bowels very loose. Astringents and tonics were prescribed, with special diet and wine. Died, May 18th. *Autopsy:* There were pleuritic adhesions on both sides, and the right lung was hepatized. The mucous membrane of the ileum was congested, thickened and softened; that of the large intestine was softened and slightly ulcerated. The kidneys were also softened.—Acting Assistant Surgeon Oscar Blank.

CASE 699.—Private J. Hepler, company H, 60th Indiana volunteers; age 40; admitted per hospital steamer City of Memphis May 10, 1863. Diarrhœa and hemorrhoids. This man was taken ill with diarrhœa in January, at Memphis, Tennessee. When admitted, besides his diarrhœa he was much troubled with hemorrhoids and was very feeble. Treatment: Tonics and astringents; half diet; subsequently whiskey as a stimulant. Died, May 19th. *Autopsy:* The liver was softened and fatty. The mucous membrane of the ileum was congested and softened. The kidneys were also softened and congested. [There is no record of the condition of the large intestine.]—Acting Assistant Surgeon Stephen R. Gay.

CASE 700.—Sergeant Henry McKnew, company B, 30th Missouri volunteers; age 26; admitted May 14, 1863. Chronic diarrhœa. The patient was much emaciated and complained of severe abdominal pain. To take three times daily a pill containing quarter of a grain of nitrate of silver and a grain each of rhubarb and opium. Milk-punch and beef-tea. The abdominal pains disappeared, but the diarrhœa continued. Died, May 21st. *Autopsy:* There were old pleuritic adhesions on the left side. The mucous membrane of the ileum and colon was ulcerated. The kidneys were soft and granular.—Acting Assistant Surgeon Stephen R. Gay.

CASE 701.—Private William Hunt, company A, 54th Indiana volunteers; age 28; admitted from hospital steamer City of Memphis May 10, 1863. Diarrhœa and bronchitis. Treatment: Expectorants and tonics; full diet. May 13th: The cough is improving, but the diarrhœa grows worse. R. Nitrate of silver two grains, powdered opium eight grains, powdered rhubarb eight grains; make eight pills. Take one every three hours. Milk-punch and beef-tea. May 14th: Complains of some abdominal pain and tenderness. May 15th: The abdominal soreness is increasing. Continue treatment. Died, May 22d. *Autopsy:* The mucous membrane of the ileum and colon was much softened. The kidneys were soft and granular.—Acting Assistant Surgeon Stephen R. Gay.

CASE 702.—Corporal H. F. Graham, company B, 118th Illinois volunteers; admitted from hospital steamer City of Memphis April 8, 1863. Chronic diarrhœa and anasarca. Was taken sick in November, 1862, at Memphis, Tennessee. Treatment: Astringents and opiates. Died, May 22d. *Autopsy:* The mitral valve was thickened and contracted. The two kidneys weighed about eighteen ounces and a half. [There is no record of the condition of the intestinal canal.]

CASE 703.—Private Lewis Warren, company G, 10th Missouri volunteers; age 20; admitted from hospital steamer City of Memphis April 25, 1863. Chronic diarrhœa. Was taken sick at Vicksburg, Mississippi, in November, 1862. He continued to get worse and worse, and reached this place a skeleton. Infusion of helianthemum was prescribed, and the following: R. Tannic acid one scruple, Dover's powder half a drachm, subnitrate of bismuth one drachm, aromatic powder two scruples; make twenty powders. Take one every three hours. April 28th: Substituted an emulsion of turpentine containing morphia. For diet, thickened milk and crackers; blackberry cordial, wine and toddy as stimulants. Died, May 23d. *Autopsy:* There were old pleuritic adhesions on both sides and tubercles in both lungs. The colon was ulcerated. The mesenteric glands were enlarged. The kidneys were soft and granular, and there were some tubercles in the left kidney.—Acting Assistant Surgeon Wm. A. McMurray.

CASE 704.—Private H. J. Edington, company I, 96th Ohio volunteers; age 22; admitted from hospital steamer City of Memphis May 10, 1863. Quotidian intermittent fever and chronic diarrhœa. The patient was extremely nervous and could not lie still. Treatment: Quinine and morphia; full diet. May 12th: Is quieter. Treatment continued. May 13th: The diarrhœa is profuse, and he complains of severe pain in the abdomen. Quinine and astringents; half diet. May 15th: No improvement. The pain in the abdomen is increasing; the stools are small and mucous. To take pills of nitrate of silver and opium, beef-tea, milk-punch. Died, May 23d. *Autopsy:* There were old pleuritic adhesions on both sides, and fifty-four ounces of purulent serum in the right side of the chest. The mucous membrane of the colon was softened and ulcerated. The kidneys were soft and granular. The urine was albuminous.—Acting Assistant Surgeon Stephen R. Gay.

CASE 705.—Private Elias Jacobs, company D, 31st Iowa volunteers; admitted April 25, 1863. Chronic diarrhœa. Was taken sick at Helena, Arkansas. Treatment: Astringents and half diet. Died, May 28th. *Autopsy:* There was lobular pneumonia of both lungs, and pleuritic adhesions on both sides. The liver was fatty. The mucous membrane of the ileum and colon was softened and ulcerated. The kidneys were soft and granular.

Case 705.—William B. Stowe, quartermaster's clerk, admitted May 14, 1863. Chronic diarrhœa of five months' standing. He was treated with astringents, opiates and stimulants, and at first with good effect. May 17th: He had but one passage, which was of natural consistence. May 20th: The diarrhœa recurred, and continued until death. Died, May 31st. *Autopsy:* There were pleuritic adhesions on the left side. The mucous membrane of the ileum and colon was congested, softened and ulcerated.—Acting Assistant Surgeon William H D. Noyes.

Case 707.—Private S. Brown, company E, 31st Iowa volunteers; age 44; admitted from hospital steamer City of Memphis May 10, 1863. Chronic diarrhœa. This man was taken sick in November, 1862, at Helena, Arkansas. After admission to this hospital he was treated with opium, astringents and stimulants. Died, June 7th. *Autopsy:* There was a deposit of tubercles in the upper lobe of the right lung. The mucous membrane of the ileum and colon was softened and much ulcerated. The kidneys were softened and congested.

The next case was forwarded on a medical descriptive list from Hospital No. 4, Louisville, Kentucky, Acting Assistant Surgeon John E. Crowe, in charge:

Case 708.—Private Henry Sluder, company I, 24th Indiana battery; age 33; admitted August 20, 1863. Chronic diarrhœa. When admitted the patient was very weak and much emaciated; pulse 100. He had about ten or twelve evacuations daily. He stated that he had been suffering with diarrhœa for about four months. Has performed no duty for two months. ℞. Powdered opium six grains, tannin ten grains; make six powders. Take one every three hours. Whiskey every two hours; milk diet. August 21st: Had ten evacuations during last night. Treatment continued, with the addition of beef-tea. August 22d: Substitute the following: ℞. Subnitrate of bismuth half a drachm, powdered opium eight grains; make eight powders. Take one every three hours. August 25th: Condition continues without much change; pulse 95. Substitute opium, in grain doses every three or four hours, for the former medicine. August 29th: Sinking. Pulse feeble and over 100. Died during the morning. *Autopsy* six hours after death: The lungs, heart, liver and stomach were healthy. The small intestine was healthy to about fourteen or sixteen inches above the ileo-cæcal valve, below which point the mucous membrane of the ileum was inflamed. The whole course of the large intestine from the cæcum to the anus was honey-combed with ulcers, the ulceration being most extensive in the ascending colon, where almost the whole of the mucous membrane of the bowel was destroyed. About twelve inches above the ileo-cæcal valve there was a diverticulum of the ileum about two inches long and of nearly the same diameter as the ileum.—Acting Assistant Surgeon Abram V. Brewer.

The next two cases were forwarded on medical descriptive lists from Hospital No. 9, Louisville, Kentucky, Surgeon Frank Meacham, U. S. V., in charge:

Case 709.—Private Gibson Snodgrass, company D, 18th Kentucky volunteers; age 34; admitted May 11, 1863. Chronic diarrhœa. From the statement of the patient it appears that he contracted diarrhœa while in camp near Murfreesborough; it assumed the dysenteric form, and he had free discharges of blood and mucus. When admitted he was much emaciated, but the diarrhœa was not frequent or severe, and for some two weeks he improved slowly. About this time, owing to some imprudence in diet, he grew suddenly worse. The diarrhœa returned with great severity and he was rapidly prostrated. The dejections became thin and yellowish, but not mixed with either blood or mucus. He was treated with pills of nitrate of silver and opium, citrate of iron and quinia; rubefacients to the abdomen, milk-punch and other stimulants; a nourishing diet, &c. June 4th: Bilious vomiting set in, accompanied by tormina and tenesmus. Died, June 7th. *Autopsy* four hours after death: Rigor mortis strongly marked; emaciation extreme. The brain and its membranes were healthy. There were old pleuritic adhesions on the right side, and recent ones on the left side between the lung and the diaphragm. A few tubercles were scattered through both lungs, most abundantly in the upper lobes; some of them were cretefied. The heart and pericardium were normal. The liver was also normal; the gall-bladder was full of fluid bile. The stomach was contracted, and contained a little bile mixed with mucus. The spleen was small but healthy. The mesenteric glands were greatly enlarged. The kidneys and suprarenal capsules were normal. In the small intestine both the solitary glands and the glands of Peyer were enlarged and ulcerated. The large intestine was ulcerated throughout its whole extent.—Acting Assistant Surgeon David W. Flora.

Case 710.—Private George Halinger, company K, 2d Missouri volunteers; age 47; admitted June 24, 1863. Acute dysentery. [This man appears on the register of hospital No. 20, Nashville, Tennessee, admitted June 20th—dysentery—sent to general hospital June 24th.] He said he had been sick about ten days or two weeks. His countenance was extremely anxious, features pinched; pulse 100 and feeble; tongue coated brown; abdomen tender over the transverse and descending colon, particularly at the sigmoid flexure; stools frequent and largely mixed with blood. There was tormina, tenesmus and prolapsed rectum. June 25th: ℞. Dover's powder twenty grains, sulphate of morphia four grains; make five powders. Take one every four hours. Toast, tea, boiled milk. June 26th: The stools are bloody and frequent; tongue becoming lighter colored; pulse feeble and compressible. There is nausea and intense thirst. ℞. Sulphate of morphine five grains, persulphate of iron ten grains, powdered cinnamon twenty grains; make five powders. Give one once or twice a day. A mustard plaster to the stomach; an ounce of wine three times a day. Diet as before. June 27th: Is much worse; hiccough has set in. The skin is cold and clammy; the stools bloody and somewhat purulent. Continue treatment. An ounce of wine every three hours. Died, June 28th. *Autopsy* twelve hours after death: Rigor mortis strongly marked; body but little emaciated. There was considerable effusion of serum beneath the arachnoid, and the surface of the brain was much congested; on removing the brain an ounce of serum was found at the base of the skull. The lungs were normal; extensive adhesions were found at the apex of the right lung, and between its lower lobe and the diaphragm. The heart was normal. The liver was healthy, except some old adhesions with the diaphragm opposite the pleural adhesions above mentioned; the gall-bladder was full of bile. The

stomach contained seven ounces of fluid; its mucous surface was slightly congested in patches. The spleen was rather small. The pancreas was unusually large but healthy. The kidneys presented nothing abnormal. The duodenum and jejunum were slightly congested, and contained a good deal of bilious matter. The ileum was thickened and softened, especially near the ileo-cæcal valve. The cæcum was intensely inflamed; and the whole tract of the colon and rectum was congested, thickened and softened, and ulcerated in patches. The bladder was empty.—Acting Assistant Surgeon David W. Flora.

The note of the following case was forwarded, with the specimen, from TAYLOR HOSPITAL, Louisville, Kentucky, Assistant Surgeon William T. Okie, U. S. A., in charge:

CASE 711.—Private Hanson Sherwood, company C, 1st Michigan cavalry; admitted February 4, 1864. Chronic diarrhœa. On the morning of the 22d he was suddenly seized with dyspnœa, and died at 4 P. M. the same day. The epiglottis was scarified a few minutes prior to death, and preparations for laryngotomy were being made when he expired. *Autopsy:* There was well-marked œdema of the epiglottis. [The condition of the abdominal viscera is not recorded.]—Assistant Surgeon William T. Okie, U. S. A. [No. 302, Medical Section, Army Medical Museum, is from this case. The specimen consists of the larynx and trachea, laid open from behind, and exhibiting considerable œdema of the epiglottis. The mucous membrane of the larynx and trachea is apparently healthy.]

The next sixty-three cases are from the case-book of HOSPITAL No. 1, Nashville, Tennessee, with the exception of the first case in the series, which was forwarded on a medical descriptive list, Surgeon Caleb W. Horner, U. S. V., in charge:

CASE 712.—Private Daniel Haviland, company G, 10th Michigan volunteers; age 35; admitted August 10, 1863. Dysentery. The patient states that he was taken with a chill July 1st—on the following day dysentery commenced. He is now greatly emaciated, exceedingly weak, and has from six to eight evacuations daily; the discharges are whitish and mixed with blood. He has pain in the iliac region, and tenesmus; pulse 70 and small; tongue moist, with a white fur in the centre; appetite good. Gave an ounce of castor oil with twenty drops of laudanum, to be followed by pills of opium and acetate of lead every four hours; six ounces of milk-punch daily; opium suppositories; milk diet. August 15th: Is improving. The number of discharges has been reduced to three or four daily, but are otherwise the same; the tenesmus is much diminished. The pills of opium and acetate of lead to be continued; four ounces of wine daily instead of the punch. August 20th: The patient commenced to vomit this morning, ejecting a greenish fluid. Ordered a third of a grain of sulphate of morphia every four hours. Continue the wine. August 23d: The vomiting still continues; pulse 100 and very small. Died during the day. *Autopsy* eighteen hours after death: Body greatly emaciated. The lower lobes of both lungs were emphysematous, while the upper lobes were congested. The heart was small and flabby. The ascending and transverse colon were studded with large deep ulcerations. Parts of the small intestine were highly injected, and an abrasion of the mucous membrane was noticed in several parts of the ileum. The mesenteric glands were enlarged and of a purple color. The spleen was slightly enlarged, but apparently healthy. The kidneys were healthy. The liver was of normal size and color, but there was a large abscess about two inches in diameter, containing about four ounces of laudable pus, in the superior anterior part of the right lobe.—Assistant Surgeon Charles J. Kipp, U. S. V.

CASE 713.—Private William H. Gorman, company B, 69th Ohio volunteers; age 25; admitted October 17, 1863. Anæmia. Died, October 25th. *Autopsy* thirty-four hours after death: Body greatly-emaciated. Brain not examined. There were recent pleuritic adhesions on the right side. The lower lobe of the right lung was congested and contained one hard tubercle; there was also some slight congestion of the lower lobe of the left lung. The heart was small and contained a small post mortem clot in the right side. The mesenteric glands were very much enlarged. The mucous membrane of the ileum was inflamed and slightly abraded. The large intestine was extensively ulcerated. The liver, spleen and kidneys were normal.

CASE 714.—Private John Evans, company D, 6th Kentucky cavalry; age 43; admitted from the field hospital of the army of the Cumberland, Stevenson, Alabama, October 12, 1863. Chronic diarrhœa. Died, October 29th. *Autopsy* twenty-four hours after death: Brain not examined. The whole surface of the right lung was coated with pus-like lymph; the upper lobe of the right lung was hepatized gray, the lower lobe was engorged with blood; the lower lobe of the left lung was hepatized red. The pericardium and heart were normal. The left lobe of the liver was somewhat fatty. The spleen was normal. The cortical portion of the kidneys was enlarged. The bladder was distended with urine. The mesenteric glands were very much enlarged. The mucous membrane of the stomach presented a small patch of inflammation; that of the intestines was inflamed throughout, and presented a few small ulcers with numerous small isolated deposits which were hard to the touch, and when cut into exuded a bloody fluid. [Enlarged solitary follicles?]

CASE 715.—Private Archibald C. Winders, company A, 81st Indiana volunteers; admitted October 17, 1863. Chronic diarrhœa. Died, October 29th. *Autopsy* eleven hours after death: Body moderately emaciated. Brain not examined. The lungs, pleuræ and heart were normal, as were also the liver, spleen and kidneys. The mesenteric glands were greatly enlarged. The mucous membrane of the stomach was slightly inflamed; that of the small intestine very much inflamed and extensively ulcerated, especially in its lower portion, which presented a number of longitudinal ulcers from two to four inches in length, was of a dark livid color and very offensive odor. The colon also was much inflamed, and contained numerous small ulcers.

CASE 716.—Private Justus A. Balcom, company G, 21st Michigan volunteers; age 20; admitted from the field hospital of the army of the Cumberland, near Stevenson, Alabama, October 23, 1863. Chronic diarrhœa. Died, October 31st. *Autopsy* twelve hours after death: Body moderately emaciated and very pale. Brain not examined. There were pleuritic adhesions on

the left side, and about half a pint of serum in the left pleural sac. The heart was healthy, and had large post mortem clots in its cavities. The lower lobe of the left lung and the posterior portion of the upper lobe were in the stage of gray hepatization; the right lung was healthy but somewhat congested at its base. The liver was very large, but apparently healthy, except that it was a little darker than usual. The spleen was as large again as usual, and much darker. The kidneys and bladder were healthy. The mesenteric glands were slightly enlarged. The mucous membrane of the stomach was slightly inflamed; that of the lower portion of the small intestine and of the colon was somewhat inflamed and abraded.

CASE 717.—Corporal James Lucas, company G, 15th United States infantry; age 23; admitted October 23, 1863. Chronic diarrhœa. Died, October 31st. *Autopsy* thirty hours after death: Body very greatly emaciated. Brain not examined. There were recent pleuritic adhesions on the right side. Both lungs contained softened tubercles, and there was a cicatrix (apparently) at the apex of the left lung. The pericardium contained about five or six ounces of fluid. The heart was healthy and of natural size. The liver, spleen, kidneys and bladder were healthy. The mesenteric glands were very much enlarged. The stomach was healthy. There was extensive inflammation and abrasion of the small intestine, with deep and numerous ulcers in the colon.

CASE 718.—Private Michael Keiner, company K, 21st Wisconsin volunteers; age 38; admitted October 17, 1863. Chronic diarrhœa. Died, November 4th. *Autopsy* thirty-six hours after death: Body very greatly emaciated. Brain not examined. There were slight recent pleuritic adhesions on the right side; a few isolated and softened tubercles in the apex of the left lung, and slight congestion, with some tubercles, in the base and posterior part of the right lung; both lungs contained an excess of black pigment. The pericardium and heart were normal. The liver was enlarged and tough; it weighed four pounds and two-tenths. The spleen weighed six ounces and a half. The left kidney was engorged and weighed six ounces and a half; the right kidney weighed four ounces and a half. The mesenteric glands were much enlarged. The stomach was natural. The small intestine was inflamed and slightly abraded; the large intestine inflamed and ulcerated.

CASE 719.—Private William Melendy, company K, 44th Indiana volunteers; age 28; admitted October 23, 1863. Chronic dysentery. Died, November 10th. *Autopsy* fifty hours after death: Body greatly emaciated. There were no pleuritic adhesions. The apices of the lungs contained deposits of tubercles, and the bronchial tubes contained a dark puriform matter. The pericardium and heart were healthy; the heart weighed ten ounces. There was considerable peritoneal inflammation, especially in the pelvic region. The intestines were coated with lymph, and three or four ounces of pus were found in the pelvic cavity. The liver appeared to be normal; it weighed three pounds and a half. The spleen was healthy and weighed ten ounces. The kidneys were healthy and weighed four ounces each. The mesenteric glands were much enlarged. The stomach was distended with a dark fluid. The duodenum was slightly inflamed. The large intestine was extensively and deeply ulcerated; the ulcers had indurated edges and in some places had almost perforated.

CASE 720.—Private Elijah Ramsay, company A, 5th East Tennessee cavalry; age 27; admitted October 17, 1863. Chronic diarrhœa. Died, November 10th. *Autopsy* thirty-eight hours after death: Body moderately emaciated; eyes mortified [?]. There were numerous pleuritic adhesions on the right side. Softened tubercles were found at the apex of the right lung. The mucous membrane of the bronchial tubes was much thickened. The pericardium and heart were healthy; the heart weighed eight ounces. The liver weighed four pounds and a half; the gall-bladder was very much distended with bile. The spleen weighed eight ounces. The mesenteric glands were much enlarged. The right kidney weighed six ounces, the left six and a half. The stomach appeared to be healthy but contained a very dark fluid. The duodenum was slightly inflamed. The large intestine was extensively abraded, and presented numerous ulcers with indurated edges.

CASE 721.—Private Ephraim Lambert, company F, 92d Illinois volunteers; age 21; admitted October 17, 1863. Chronic diarrhœa. Died, November 13th. *Autopsy* twenty-six hours after death: Body very greatly emaciated. There were pleuritic adhesions on the left side, and a few hard calcareous tubercles in the apex of the left lung; in the apex of the right lung there were a number of softened tubercles; the posterior parts of both lungs were slightly congested. The pericardium and heart were healthy, the latter weighing only six ounces and a half; the cavities of the heart contained large post mortem clots, partly light-yellow and partly dark colored. The liver was healthy in structure and weighed two pounds ten ounces; the gall-bladder was distended with a light-yellow fluid, which had but little appearance of bile. The spleen was healthy and weighed four ounces. The kidneys were also healthy; the right weighed three ounces and a half, the left four and a half. The mesenteric glands were very much enlarged. The stomach presented patches of congestion near the cardiac orifice. Similar congested areas were found in the small intestine. The colon was extensively and deeply ulcerated; the ulcers had jagged indurated edges. A fibro-calcareous tumor, about three-quarters of an inch in diameter, was found attached to the ileum by a slender pedicle half an inch in length.—Assistant Surgeon Charles J. Kipp, U. S. V. [No. 53, Medical Section, Army Medical Museum, is from this case. The specimen consists of a portion of the ileum with the tumor just described; it proved to be composed of dense connective tissue in which there was an irregular deposit of calcareous matter, giving it a bone-like hardness.]

CASE 722.—Private William E. Smith, company B, 12th East Tennessee cavalry; admitted October 24, 1863. Acute bronchitis. Died, November 18th. *Autopsy* sixteen hours after death: Body but little emaciated. There were no pleuritic adhesions. The heart was healthy in structure and contained yellowish clots in the left ventricle; it weighed eleven ounces. The pericardium was healthy. There were a few tubercles at the base of each lung. The larynx was slightly inflamed. The lower portion of the trachea and the bronchial tubes were highly inflamed, and the smaller bronchial tubes contained a quantity of purulent fluid. The liver appeared to be healthy; it weighed three pounds and a half. The spleen weighed eight ounces. The right kidney weighed eight ounces, the left ten; both contained tubercles the size of millet-seed; these were found in all parts of the organ, but were most abundant in the cortical portion immediately beneath its surface. There was a small patch of inflammation near the cardiac orifice of the stomach. In the small intestine there were several patches of severe inflammation. The large intestine was generally inflamed and presented a few small ulcers. A lumbricoid worm about a foot long was found in the cæcum.

CASE 723.—Private John Glaspey, company F, 33d Ohio volunteers; admitted from the field hospital of the army of the Cumberland, Stevenson, Alabama, October 23, 1863. Chronic diarrhœa. Died, November 20th. *Autopsy* twenty-four hours after death: Body greatly emaciated; abdomen tympanitic and of a livid color. There were strong pleuritic adhesions on the right side. The right lung was filled with tubercular deposits, most of them completely broken down into pus; there were large cavities at the apices of the lungs; the lower lobe of the left lung was in the stage of gray hepatization. The heart was healthy and weighed nine ounces; there was a firm light colored clot in the left ventricle. The liver was dark colored, but of healthy consistence; it weighed three pounds seven ounces; the gall-bladder was empty. The kidneys weighed six ounces each. The spleen weighed nine ounces. The mesenteric glands were very much enlarged. There were numerous tubercular deposits throughout the small intestine, [enlarged solitary follicles?] and several ulcers in the mucous membrane of the large intestine.

CASE 724.—Private Joseph Wells, company C, 90th Illinois volunteers; age 24; admitted November 17, 1863. Diarrhœa. Died, November 28th. *Autopsy* twenty-two hours after death: Body very much emaciated. The base of the right lung was slightly congested and contained a large calcareous tubercle. The bronchial tubes contained a small quantity of light puriform matter. The heart was healthy and weighed eight ounces; there were small fibrinous clots in the cavities of both sides. The spleen weighed seven ounces and a half. The kidneys weighed six ounces each. The mesenteric glands were very much enlarged, and the mesentery very much congested. The stomach was contracted and its mucous membrane thrown into longitudinal folds. The mucous membrane of the small intestine and of the cæcum was very extensively inflamed. The colon and rectum presented numerous large, deep, ragged ulcers.

CASE 725.—Corporal David M. Chatfield, company D, 2d Indiana cavalry; age 25; admitted November 17, 1863. Chronic diarrhœa. Died, December 7th, of double pneumonia. *Autopsy* nineteen hours after death: Body very little emaciated. There were recent pleuritic adhesions on both sides. The upper lobe and the upper portion of the lower lobe of the right lung were in the stage of gray hepatization; the lower lobe of the left lung and the lower portion of the upper lobe were hepatized red, approaching gray. The heart was healthy and weighed eleven ounces and a half. The liver weighed five pounds six ounces. The spleen weighed nine ounces. The kidneys weighed seven ounces and a half each. The bladder was greatly distended with urine. The mesenteric glands were somewhat enlarged. The stomach was healthy. There were a few small patches of inflammation in the small intestine. The large intestine was healthy.

CASE 726.—Private George Weldon, company M, 6th Kentucky cavalry; age 21; admitted December 3, 1863. Chronic diarrhœa. Died, December 7th. *Autopsy* twenty-one hours after death: Body moderately emaciated. There were recent pleuritic adhesions on the left side, and both lungs were firmly adherent to the diaphragm. The heart was healthy and weighed nine ounces and a half. The liver weighed four pounds four ounces. The spleen was light colored but of normal texture, and weighed twelve ounces. The kidneys weighed five ounces and a half each. The mesenteric glands were very much enlarged. The stomach was healthy. There were several patches of inflammation in the small intestine. The large intestine was highly inflamed; its mucous membrane was thickened and presented several large isolated ulcers.

CASE 727.—Private Christopher Walter, company A, 99th Ohio volunteers; age 27; admitted December 3, 1863. Chronic diarrhœa. Died, December 21st. *Autopsy* twenty-four hours after death: Body greatly emaciated. There were recent pleuritic adhesions on the right side. The lower lobe of the right lung, and the lower portions of the middle and upper lobes were hepatized red; the lower and posterior portions of both lobes of the left lung were also hepatized. The heart weighed twelve ounces and contained a large firm light-yellow clot. The omentum was atrophied, a few shreds only remaining. The liver weighed four pounds and a half; the spleen six ounces. The lungs, liver and spleen were filled and covered over with small light yellow masses about the size of mustard-seeds, or rather larger; these had the appearance of tubercles, were of firm consistence, and were closely adherent to the adjacent tissue; they were more abundant in the liver and spleen than in the lungs, and were more numerous on the surface than through the substance of the organs. The right kidney weighed eight ounces, the left nine and a half. The mesenteric glands were very much enlarged. The mucous membrane of the stomach was inflamed, and near the pyloric orifice very much thickened; that of the small intestine was extensively inflamed and presented a few slight abrasions. The mucous membrane of the colon and rectum was also inflamed and presented a few isolated ulcers. The cæcum was free from disease.

CASE 728.—Private Abner A. Wheeler, company B, 63d Illinois volunteers; admitted from hospital No. 13, December 28, 1863. Chronic diarrhœa. Died, December 29th. *Autopsy* thirty-six hours after death: Body moderately emaciated. There were slight pleuritic adhesions on both sides. In the left lung there was a calcareous tubercle the size of a pea; the lower lobe of the right lung was much congested. The heart was healthy and weighed nine ounces. The liver weighed five pounds and a half; it appeared to be somewhat fatty, and contained a few small purulent collections. The spleen weighed one pound and was somewhat indurated. The ascending, transverse and descending colon, and the rectum were very much inflamed and ulcerated; in the transverse colon there were several perforations [?]. The omentum and mesentery contained an unusual amount of fat.

CASE 729.—Private Patrick H. Kimbro, company A, 18th Alabama, (rebel;) admitted January 4, 1864. Chronic diarrhœa. Died, January 5th, of peritonitis. *Autopsy* thirty-six hours after death: Body greatly emaciated; abdomen somewhat distended with fluid; the whole surface had a deep icteroid hue. There were strong pleuritic adhesions on the right side. The lower lobe of the right lung was congested. The pericardium and heart were healthy; the heart weighed eleven ounces. The abdominal cavity contained about a gallon of high colored serum, which was mingled with pus in the pelvic cavity. There were a few small blood-clots between the peritoneum and the abdominal walls. The intestines were connected with the anterior abdominal walls by large deposits of lymph, by which also the knuckles of intestine were connected together. The liver weighed three pounds three ounces; it was firm in texture, and externally of a dirty brown color; the gall-bladder contained a dark-brown tenacious fluid. The spleen was healthy and weighed one pound. Both kidneys had a dirty yellowish appearance; the right weighed six ounces, the left seven. [The condition of the intestinal mucous membrane is not recorded.]

CASE 730.—Private John R. Cherry, company D, 32d Alabama, (rebel;) admitted December 31, 1863. Chronic diarrhœa. Died, January 6, 1864. *Autopsy* thirty-six hours after death: Body greatly emaciated. The upper lobe of the right lung was strongly attached to the posterior walls of the chest and contained numerous large tubercles and several cavities; the lower lobe was hepatized red; the upper lobe of the left lung was filled with tubercles. The heart was healthy and weighed nine ounces and a half. The liver weighed two pounds ten ounces. The spleen weighed seven ounces. The right kidney weighed four ounces and a half, the left five ounces. The mesenteric glands were very much enlarged. The mucous membrane of the small intestine was inflamed. [The condition of the large intestine is not recorded.]

CASE 731.—Private Jesse Leaper, company I, 4th Indiana cavalry; admitted December 21, 1863. Chronic diarrhœa. [This man also appears on the register of hospital No. 3, Nashville, admitted December 18th—chronic diarrhœa—sent to general hospital December 21st.] Died, January 7, 1864. *Autopsy* eighteen hours after death: Body greatly emaciated. The thoracic viscera were healthy. The heart weighed seven ounces and a half. The liver weighed three pounds three ounces; the spleen eight ounces. The kidneys weighed six ounces and a half each. The mesenteric glands were very much enlarged. The mucous membrane of the small intestine was a good deal inflamed. The large intestine presented numerous enormously large and deep ulcers, some of them almost perforating the intestinal coats.

CASE 732.—Private John W. Riley, company B, 32d Alabama, (rebel;) age 43; admitted January 4, 1864. Diarrhœa. Died, January 10th. *Autopsy* thirty-six hours after death: Body greatly emaciated. The lower lobe of the right lung and the posterior portions of both lobes of the left were hepatized gray. The heart weighed nine ounces. The liver weighed three pounds four ounces. The spleen weighed eight ounces. The kidneys were fatty and weighed six ounces each; the bladder was distended with urine. The mesenteric glands were slightly enlarged. The stomach, small intestine and rectum were healthy. The transverse and descending colon presented numerous small recent ulcers.

CASE 733.—Private John H. Barnes, company F, 9th Mississippi, (rebel;) admitted January 3, 1864. Rheumatism. Died, January 12th, of chronic dysentery. *Autopsy* twelve hours after death: Body greatly emaciated. There were strong pleuritic adhesions on the right side. The greater portion of the lower lobe of the left lung was engorged, and the whole of the posterior portion of the right lung was hepatized red. The heart was healthy and weighed seven ounces. The liver was slightly congested and weighed four pounds. The spleen weighed eight ounces. The kidneys were slightly engorged; the right weighed seven ounces, the left eight. The mesenteric glands were very greatly enlarged. The mucous membrane of the stomach was highly inflamed. The small intestine was generally inflamed; and the mucous membrane of the colon and rectum was entirely destroyed by ulceration.

CASE 734.—Private Frank Gangloff, company C, 69th Ohio volunteers; age 54; admitted December 28, 1863. Chronic diarrhœa. [This man appears on the register of the hospital of his regiment, sent to Chattanooga, December 16th; no diagnosis. He appears on the records of the medical director's office, Chattanooga, admitted December 15th—rheumatism; no disposition; and on the register of hospital No. 12, Nashville, admitted December 25th—chronic diarrhœa—sent to general hospital December 28th.] Died, January 13, 1864. *Autopsy* fifteen hours after death: Body greatly emaciated. There were tubercular deposits, beginning to soften, in the upper lobe of each lung. The heart was healthy and weighed seven ounces. The liver weighed three pounds fifteen ounces. The spleen weighed five ounces. The right kidney weighed four ounces and a half, the left, which was slightly congested, weighed five ounces and a half; the bladder was distended with urine. The mesenteric glands were somewhat enlarged. The mucous membrane of the greater curvature of the stomach and of the lower portion of the small intestine was slightly inflamed. The lower portion of the colon and the whole of the rectum presented numerous large and apparently old ulcers, some of which appeared to be cicatrizing.

CASE 735.—Private John P. Turner, company G, 18th Alabama, (rebel;) admitted from prison hospital January 2, 1864. Intermittent fever. Died, January 15th, of chronic diarrhœa and pneumonia. *Autopsy* twelve hours after death: The body was generally œdematous; the abdomen a good deal distended. There were extensive pleuritic adhesions on the right side. The lower lobe of the right lung was in the stage of red hepatization, and the posterior portion of the upper and middle lobes highly congested; the lower lobe of the left lung was congested. The heart weighed eight ounces; its mitral valves were a good deal thickened. The abdomen contained about three pints of clear serum. The liver weighed two pounds ten ounces. The spleen weighed five ounces. The right kidney weighed six ounces and a half, the left four and a half. The mesenteric glands were slightly enlarged. The stomach and intestines were distended with gas. The mucous membrane of the small intestine was much inflamed; that of the large intestine inflamed and ulcerated. There were small deposits of lymph on the surface of the intestines and mesentery.

CASE 736.—Private Jacob Wright, company C, 88th Illinois volunteers; age 22; admitted November 7, 1863. Chronic dysentery. Died, January 15, 1864. *Autopsy* fifteen hours after death: Body very greatly emaciated. There were slight pleuritic adhesions on the right side, and strong ones on the left side posteriorly. The lower lobe of the left lung and the lower portion of the upper lobe were in the stage of gray hepatization; the lower lobe of the right lung was somewhat congested. The heart weighed eight ounces and contained large light yellow clots. The liver weighed three pounds and a half; it was somewhat fatty. The spleen was congested and weighed thirteen ounces. The right kidney weighed four ounces, the left five. The mesenteric glands were very much enlarged. The stomach was healthy. The small intestine presented a few patches of slight inflammation. The cæcum was highly inflamed and its mucous membrane a good deal abraded. The lower portion of the colon and the rectum were extensively and deeply ulcerated.

CASE 737.—Private Jacob Keifauber, company H, 97th Illinois volunteers; age 22; admitted December 2, 1863. Chronic dysentery. [This man appears on the hospital register of his regiment, admitted October 2d—chronic diarrhœa—sent to convalescent camp October 10th. No subsequent record is found until his admission to this hospital.] Died, January 17,

1864. *Autopsy* twenty-four hours after death: Body greatly emaciated. The lower portion of the lower lobe of the right lung was solidified, approximating the stage of gray hepatization. The heart weighed twelve ounces. The liver weighed four pounds eleven ounces. The spleen was of a dirty brown color and weighed one pound. The kidneys were a good deal congested and weighed seven ounces each. The peritoneum was somewhat inflamed, and there were small deposits of lymph on the surface of the intestines and the mesentery. The mesenteric glands were somewhat enlarged. The mucous membrane of the lower portion of the small intestine was inflamed. In the lower portion of the colon and throughout the rectum there were numerous ulcers, some of which were very deep.

CASE 738.—Private John Cole, company B, 81st Illinois volunteers; admitted January 4, 1864. Intermittent fever. Died, January 17th, of chronic diarrhœa. *Autopsy* twenty-four hours after death: Body moderately emaciated; legs and feet œdematous. There were strong pleuritic adhesions on the right side. The right lung was in the stage of gray hepatization. The pericardium contained about an ounce of serum. The heart weighed twelve ounces, and contained a large light yellow clot in its right ventricle, a large dark clot in the left. The liver was of a very light yellow color, fatty, and weighed four pounds and a half. The cortical portion of both kidneys was very light colored; they weighed six ounces and a half each. The spleen weighed eight ounces. The mesenteric glands were enlarged. The small intestine was inflamed, the large intestine ulcerated.

CASE 739.—Private William Dunsmore, company B, 37th Tennessee, (rebel;) admitted from prison hospital January 4, 1864. Diarrhœa. Died, January 19th, of pneumonia. *Autopsy* six hours after death: Body greatly emaciated. The lower portion of the lower lobe of the right lung was in the stage of red hepatization. The heart weighed six ounces. The liver was very dark colored and weighed two pounds ten ounces. The spleen was healthy and weighed five ounces. Both kidneys were healthy; they weighed three ounces and a half each. The mesenteric glands were somewhat enlarged. The lower portion of the small intestine was inflamed. The large intestine was ulcerated.

CASE 740.—Private Levi Rucker, company B, 31st Iowa volunteers; age 32; admitted December 3, 1863. Chronic diarrhœa. Died, January 22, 1864, of consumption and chronic diarrhœa. *Autopsy* eighteen hours after death: Body very greatly emaciated. There were extensive pleuritic adhesions on the right side; the right pleural sac contained about four ounces of serum, the left pleural cavity about eight ounces. The lower lobe of the right lung was congested, the middle lobe in the stage of gray hepatization; in the upper lobe there were many soft tubercles and several small vomicæ; the upper lobe of the left lung also was filled with soft tuberculous matter, and there were some large vomicæ at its apex. The heart weighed seven ounces. The liver weighed two pounds fourteen ounces. The right kidney weighed five ounces and a half, the left six ounces. The spleen weighed seven ounces. The mesenteric glands were unusually enlarged, and contained cheesy tuberculous deposits. Peyer's patches were very much thickened, and some of them were ulcerated. The lower portion of the small intestine was greatly inflamed. The rectum was inflamed and presented a few ulcers.

CASE 741.—Private Prescora Drake, company A, 66th Georgia, (rebel;) admitted from Provost Marshal January 7, 1864. Chronic diarrhœa. Died, January 23d. *Autopsy* thirty-six hours after death: Body greatly emaciated. There were no pleuritic adhesions, and the lungs were healthy. The heart was healthy and weighed seven ounces and a half. The liver weighed four pounds two ounces. The spleen weighed sixteen ounces. The right kidney weighed four ounces, the left five. The mesenteric glands were enlarged. The large intestine was ulcerated.

CASE 742.—Private Francis J. Calhoun, company B, 4th Florida, (rebel;) age 20; admitted from prison hospital January 2, 1864. Intermittent fever. Died, January 26th, of chronic diarrhœa. *Autopsy* twenty hours after death: Body greatly emaciated. There were recent pleuritic adhesions on the left side, and the posterior portion of the lower lobe of each lung was hepatized gray. The pericardium was slightly inflamed and contained about an ounce of serum. The heart was healthy and weighed six ounces and a half. The liver weighed two pounds and a half; the spleen seven ounces. The right kidney weighed three ounces, the left four. The mesenteric glands were very much enlarged. The small intestine was extensively inflamed; the large intestine inflamed and extensively ulcerated. The mucous membrane of the stomach, near the pyloric orifice, was also inflamed.

CASE 743.—Bryant Thornhill, rebel citizen, Jackson, Alabama; age 27; admitted from Provost Marshal January 5, 1864. Chronic diarrhœa. Died, January 28th. *Autopsy* eight hours after death: Body moderately emaciated. The lungs contained a few small calcareous tubercles at the apex of each; in other respects they were healthy. The pericardium was slightly inflamed and contained about half an ounce of serum. The heart weighed eight ounces; its valves were slightly thickened. The liver weighed three pounds three ounces; the gall-bladder contained six small very dark-colored gall-stones. The spleen was healthy and weighed nine ounces. Both kidneys were healthy; they weighed five ounces each; the bladder was somewhat distended with urine. The mucous membrane of the stomach, near the cardiac orifice, was inflamed. The lower portion of the small intestine was a good deal inflamed, and there were a few ulcers of Peyer's patches. The colon was extensively inflamed and contained numerous recent superficial ulcers.

CASE 744.—William Street, citizen, Dade County, Georgia, (rebel;) age 53; admitted January 26, 1864. Chronic diarrhœa. Died, January 29th. *Autopsy* ten hours after death: Body moderately emaciated. There were recent pleuritic adhesions on the right side posteriorly. The heart was fatty and weighed twelve ounces. The liver weighed three pounds twelve ounces; it was fatty and of a very light yellow color. The spleen weighed twelve ounces. The right kidney weighed eight ounces, the left nine. The colon was ulcerated.

CASE 745.—Samuel K. Smith, citizen, Maury County, Tennessee, (rebel;) age 57; admitted from prison hospital January 4, 1864. Rheumatism. Died, January 29th, of chronic dysentery. *Autopsy* twenty hours after death: Body moderately emaciated. There were tolerably strong pleuritic adhesions on both sides. The posterior portion of the middle and lower lobes

of the right lung was in the stage of red hepatization; the posterior portion of the left lung was in the stage of gray hepatization. The heart weighed nine ounces and a half; its valves were slightly thickened. The liver was fatty; it weighed three pounds eleven ounces, and was very yellow and soft. The spleen weighed three ounces and a half and contained a few small calcareous deposits. The kidneys were healthy; the right weighed three ounces, the left three and a half. The stomach was slightly inflamed. The small intestine contained four lumbricoid worms which averaged ten inches in length. In the large intestine there were numerous large ulcers.

CASE 746.—Joseph B. Bean, citizen, Catoosa County, Georgia, (rebel;) age 65; admitted from Provost Marshal January 10, 1864. Dysentery. Died, January 29th. *Autopsy* twenty hours after death: Body moderately emaciated. There were strong pleuritic adhesions on the left side posteriorly. The lower lobe and posterior portion of the upper lobe of the left lung were in the stage of red hepatization. The heart weighed nine ounces and a half. The aortic semilunar valves were calcareous, and the arteries of the body were everywhere atheromatous and calcareous. The liver was fatty and weighed three pounds. The spleen weighed six ounces. The kidneys weighed four ounces each. In the large intestine there were numerous small ulcers. —Surgeon C. W. Horner, U. S. V. [Nos. 310 to 312, Medical Section, Army Medical Museum, are from this case. No. 310 is the heart laid open to expose the valves. The aortic valves are the seat of calcareous deposits, and there are calcareous atheromatous patches in the aorta just above the valves. The other vessels are healthy. No. 311 is the arch and a part of the descending aorta, presenting numerous atheromatous patches with calcareous deposits in many places. No. 312 is the lower part of the descending aorta with a part of the common iliacs. In this part of the vessel the atheromatous disease is present in a higher degree, and fibrinous clots, derived from the blood, adhere to many of the roughened patches.]

CASE 747.—Private Albert Gilbert, company C, 22d Missouri, (rebel;) admitted January 2, 1864. Intermittent fever. Died, February 4th, of chronic dysentery. *Autopsy* thirty-six hours after death: Body moderately emaciated. The lower lobe of the left lung and the lower and middle lobes of the right were in a state of red hepatization approximating gray. The heart weighed nine ounces. The liver weighed four pounds seven ounces; it was of a very light yellow color and fatty. The spleen was healthy and weighed two ounces and a half. The right kidney weighed five ounces, the left four. The stomach was apparently healthy. The colon and rectum were full of very large and apparently old ulcers.

CASE 748.—Private John Morrisy, company B, 4th Michigan cavalry; admitted December 21, 1863. Chronic rheumatism. Died, February 8, 1864, of bronchitis and chronic dysentery. *Autopsy* thirty-six hours after death: Body moderately emaciated. There were slight pleuritic adhesions on the left side. There were a few tubercles in each lung, the majority of which were softened; the posterior portion of both lungs was a good deal congested. The mucous membrane of the bronchial tubes was very much inflamed, and the tubes contained a purulent fluid. The heart weighed eight ounces and contained very dark blood-clots. The liver was fatty and weighed three pounds two ounces. The spleen weighed six ounces. The kidneys were apparently contracted, the cortical portion being firmer and a good deal lighter than usual; the right weighed three ounces and a half, the left four ounces. The stomach was healthy. The small intestine was slightly inflamed, and there were a few ulcers of Peyer's patches which were transverse to the course of the intestine. The cæcum was highly inflamed, and the colon and rectum extensively ulcerated, but the ulcers were not very deep.

CASE 749.—Private James Strickland, company D, 1st Georgia, (rebel;) admitted February 2, 1864. Chronic diarrhœa. Died, February 9th, of pleuro-pneumonia. *Autopsy* six hours after death: There were strong old pleuritic adhesions about the apex of the right lung, and about half a pint of sero-sanguineous fluid in each pleural cavity; the middle and upper lobes of the right and the lower lobe of the left lung were in the stage of red hepatization; the remainder of the lungs was deeply engorged. The pericardium contained about an ounce and a half of serum. The heart weighed nine ounces and a half; there were large yellow clots in its right side. The liver weighed three pounds seven ounces; it was fatty and of a deep-yellow color. The spleen weighed three ounces. The kidneys were of a very light color; the right weighed seven ounces, the left seven and a half. The mesenteric glands were slightly enlarged. The stomach was a good deal inflamed, and a large patch of mucous membrane near the cardiac orifice was thickened and presented several slight abrasions. The small intestine was healthy, and there was a little inflammation in the rectum. The bladder was distended with urine.

CASE 750.—Private William Rogers, company C, 36th Indiana volunteers; age 24; admitted from Chattanooga February 4, 1864. Typhoid fever [?]. Died, February 9th, of chronic dysentery. *Autopsy* eighteen hours after death: Body greatly emaciated. The posterior portion of each lung was congested. The pericardium contained about an ounce of serum. The heart weighed eight ounces. The liver was slightly fatty and weighed five pounds one ounce. The spleen weighed eight ounces. The kidneys weighed five ounces and a half each. The mesenteric glands were a good deal enlarged. The peritoneum was inflamed. The intestines were very dark exteriorly, and were glued together in several places by deposits of lymph. The lower portion of the mucous membrane of the small intestine was highly inflamed and ulcerated. The cæcum was full of extremely large ulcers, one of which had perforated; this perforation was very large, and was about an inch and a half from the orifice of the appendix vermiformis. The colon and rectum contained numerous very large ulcers, and there were two large perforations in the colon; through the perforations fæcal matter had passed into the abdominal cavity.

CASE 751.—Private Joel L. Brooks, company G, 35th Illinois volunteers; age 33; admitted February 2, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital, Chattanooga, Tennessee, admitted January 8th—chronic diarrhœa—sent to general hospital February 1st.] Died, February 12th, of chronic dysentery. *Autopsy* twelve hours after death: Body very little emaciated. There was a small bony deposit in the substance of the dura mater, corresponding with a slight depression of the frontal bone about an inch above the right orbital plate; the pia mater was slightly congested, and the subarachnoid cavity contained about half an ounce of serum. There was a slight deposit of lymph upon the choroid plexus. There were moderately strong pleuritic adhesions on both sides. The lower lobe of the left and the lower and middle lobes of the right lung were deeply engorged. The pericardium contained about an ounce of serum; the heart weighed ten ounces and contained

moderately large light yellow clots. The liver was rather firm, of a light yellow color, and weighed four pounds two ounces; the gall-bladder contained about six ounces of bile. The spleen weighed nine ounces. The right kidney weighed seven ounces, the left seven and a half. The stomach contained a little mucus. The small intestine was slightly inflamed in patches. [The condition of the large intestine is not recorded.]

CASE 752.—Private Isaac Bricker, company M, 10th Ohio cavalry; age 25; admitted February 4, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital, Chattanooga, Tennessee, admitted January 12th—chronic diarrhœa—sent to general hospital February 3d.] Died, February 13th. *Autopsy* eighteen hours after death: Body greatly emaciated. On the right side of the forehead there was a cicatrix two inches in length, covering a corresponding gap in the outer table of the frontal bone an inch in length and an inch above the right superciliary ridge; there was no depression of the internal table. There was some appearance of lymph deposits on the superior surface of the cerebrum. The lower lobe of the left lung was in the stage of gray hepatization; the lower lobe of the right lung was deeply engorged, and throughout the lung-tissue there were several firm well-defined blood-clots. The heart weighed eight ounces and contained small light yellow clots. The liver was fatty and weighed three pounds twelve ounces. The spleen was firm and weighed fourteen ounces. The right kidney weighed eight ounces, the left eight and a half. The mesenteric glands were very much enlarged. The duodenum and the lower portion of the small intestine were inflamed. Peyer's patches were a good deal injected. [The condition of the large intestine is not recorded.]

CASE 753.—Private Charles L. Busher, company K, 1st Ohio volunteers; admitted February 4, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital, Chattanooga, Tennessee, admitted January 25th—chronic diarrhœa—sent to Nashville February 3d.] Died, February 15th. *Autopsy* twenty-four hours after death: Body moderately emaciated. There were pleuritic adhesions on the left side. The lower lobe of the left lung was in the stage of red hepatization and coated externally with lymph; the lung weighed two pounds two ounces; the right lung was healthy. The heart weighed eleven ounces. The liver weighed four pounds twelve ounces. The spleen weighed five ounces and a half. The right kidney weighed seven ounces, the left seven and a half. The mucous membrane of the stomach and duodenum was inflamed. The colon and rectum were ulcerated.

CASE 754.—Private Charles Albert, company B, 35th Ohio volunteers; admitted from Chattanooga February 14, 1864. Chronic diarrhœa. Died, February 15th. *Autopsy* twenty-four hours after death: Body greatly emaciated. The lungs and heart were healthy. Nothing abnormal was noted in the liver, spleen, kidneys or stomach. The small intestine was slightly inflamed. The large intestine was extensively ulcerated.

CASE 755.—Private John McMahon, company D, 2d battalion, 16th United States Infantry; age 40; admitted February 14, 1864. Chronic diarrhœa. [This man appears upon the register of the field hospital of the army of the Cumberland, Chattanooga, Tennessee, admitted February 5th—chronic diarrhœa—sent to general hospital February 13th.] Died, February 16th. *Autopsy* twenty-four hours after death: Body very greatly emaciated. The lower lobe of the left lung was deeply engorged; the central part of the middle lobe of the right lung was in the stage of gray hepatization. The heart weighed eight ounces and contained large light yellow clots in its right side. The liver weighed two pounds fourteen ounces. The spleen weighed three ounces. The right kidney weighed five ounces and a half, the left six ounces. The mesenteric glands were very much enlarged. The stomach was healthy. The lower portion of the small intestine was a good deal inflamed. The colon and rectum were extensively ulcerated.

CASE 756.—Private Joseph Millican, citizen prisoner; admitted January 13, 1864. Diarrhœa. Died, February 17th. *Autopsy* twenty-four hours after death: Body very greatly emaciated. There were moderately strong pleuritic adhesions on the right side. Both lungs contained numerous tubercular deposits; in the apex of the left lung were several large cavities; the lower lobe of the lung was engorged with blood. The bronchial tubes were filled with a purulent fluid. The heart weighed five ounces and a half. The liver weighed two pounds seven ounces and was healthy. The spleen weighed nine ounces. The right kidney weighed three ounces and a half, the left four ounces. The ileum was inflamed. The sigmoid flexure and rectum were ulcerated.

CASE 757.—Private James W. Stewart, company E, 4th Florida, (rebel;) age 23; admitted January 27, 1864. Chronic diarrhœa. [This man appears upon the register of hospital No. 2, Nashville, admitted from Chattanooga December 8, 1863—bronchitis—sent to hospital No. 1 January 27th.] Died, February 18th. *Autopsy* twenty-four hours after death: Body greatly emaciated. The bronchial tubes were inflamed. The heart was normal. The liver was healthy. The spleen weighed fourteen ounces. There was fatty degeneration of both kidneys; the right weighed seven ounces and a half, the left eight ounces. The small intestine was normal. The large intestine was inflamed and ulcerated.

CASE 758.—Private Patrick Delaney, company G, 10th Tennessee, (rebel;) admitted from prison hospital January 4, 1864. Intermittent fever. Died, February 18th, of chronic diarrhœa. *Autopsy* thirty-six hours after death: Body greatly emaciated. There were slight pleuritic adhesions on the right side. There were several hepatized patches in the interior of both lungs. The heart weighed eight ounces and a half and contained large clots. The liver was fatty and weighed two pounds thirteen ounces; the gall-bladder was empty. The spleen weighed seven ounces. The right kidney weighed four ounces, the left four and a half. The stomach was healthy. The lower portion of the small intestine was inflamed. The colon and rectum were extensively ulcerated.

CASE 759.—Private Charles Bock, company H, 1st Wisconsin cavalry; age 29; admitted December 21, 1863. General debility. [The records of the medical director's office, Nashville, Tennessee, show that this man was admitted to hospital No. 21 November 29th; no diagnosis. He appears upon the records of hospital No. 13, admitted December 18th—remittent fever—sent to general hospital No. 1 December 21st.] Died, February 20, 1864, of chronic diarrhœa. *Autopsy* twelve hours after death: Body greatly emaciated. The large bronchial tubes were inflamed on the right side, and there were old pleuritic adhesions in the right pleural sac. The heart weighed six ounces. The liver weighed two pounds five ounces. The spleen weighed

six ounces. The right kidney weighed five ounces and a half, the left six and a half. The intestines were greatly distended with gas, displacing the liver upward. The whole extent of the small intestine was congested, and in some places ulcerated. The colon and rectum were thickened, ulcerated and of a very dark color.

CASE 760.—Private Joseph Bradham, company E, 38th Indiana volunteers; age 23; admitted February 2, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital of the army of the Cumberland, Chattanooga, Tennessee, admitted January 25, 1864—dropsy—sent to Nashville February 2d.] Died, February 21st, of peritonitis. *Autopsy* twenty-four hours after death: Body greatly emaciated. There were slight pleuritic adhesions on each side, and each pleural cavity contained about four ounces of serum. The mucous membrane of the bronchi was a good deal inflamed, and the lower lobe of each lung engorged with blood. The heart weighed eight ounces. The abdomen contained about three pints of sero-purulent fluid. The intestines were coated and glued together with lymph. The liver was fatty and weighed three pounds twelve ounces. The spleen was healthy and weighed six ounces. The kidneys were rather soft and light colored; they weighed eight ounces and a half each. The mesenteric glands were very much enlarged. The mucous membrane of the stomach was very dark colored, and there were several patches of inflammation scattered along the mucous membrane of the intestines.

CASE 761.—Private James Brown, company D, 35th Illinois volunteers; age 23; admitted from Chattanooga, Tennessee, February 4, 1864. Chronic diarrhœa. Died, February 21st, of pneumonia. *Autopsy* twenty-four hours after death: Body greatly emaciated. The membranes of the brain were congested, and there were about two ounces of serum at the base of the brain. The left lung was healthy; the upper and middle lobes of the right lung were in the stage of red hepatization, the lower lobe hepatized red. The heart weighed nine ounces and a half. The liver weighed three pounds ten ounces. The spleen was engorged with blood and weighed fourteen ounces. The kidneys weighed eight ounces each. The stomach and duodenum were inflamed, and their mucous membrane was pulpy. Other parts of the small intestine were also inflamed. The colon and rectum were in a state of chronic inflammation.

CASE 762.—Private John Hennessee, company K, 35th Illinois volunteers; age 31; admitted February 2, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital of the army of the Cumberland, Chattanooga, Tennessee, admitted January 8th—chronic diarrhœa—sent to Nashville January 30th.] Died, February 23d. *Autopsy* eighteen hours after death: There were slight pleuritic adhesions on both sides. The costal pleura of the left side presented numerous small firm masses apparently tubercular in their character. The lower portion of the right lung was in the stage of gray hepatization. The heart weighed nine ounces. The liver weighed four pounds three ounces; it was of a pale-purple color externally, and contained numerous small circumscribed collections of a pus-like fluid. The spleen weighed ten ounces and a half. The kidneys were healthy. The large intestine was ulcerated.

CASE 763.—Private Michael Dilland, company A, 47th Georgia, (rebel;) age 31; admitted January 27, 1864. Chronic diarrhœa. [This man appears on the register of hospital No. 2, Nashville, admitted December 11, 1863—chronic diarrhœa—sent to general hospital January 29, 1864.] Died, February 27th. *Autopsy* twelve hours after death: Body greatly emaciated. There were slight pleuritic adhesions on the left side. The posterior portions of the right lung were œdematous. The heart weighed eight ounces. The liver was fatty and weighed three pounds. The spleen was firm and weighed eighteen ounces. The kidneys were slightly congested and weighed five ounces each. The mesenteric glands were enlarged. The bladder was distended with urine. The lower portion of the small and the whole of the large intestine were highly inflamed and abraded.

CASE 764.—George P. Derrick, citizen, Marshall County, Alabama, (rebel;) age 42; admitted from the Provost Marshal January 23, 1864. Chronic diarrhœa. [This man appears on the register of hospital No. 2, Nashville, Tennessee, admitted December 11, 1863—pneumonia—sent to the Provost Marshal January 13, 1864.] Died, February 29th. *Autopsy* twenty-four hours after death: Body greatly emaciated. The thoracic viscera were healthy, as were also the liver, spleen and kidneys. The mesenteric glands were enlarged. The lower portion of the small intestine was highly inflamed. The large intestine was inflamed and extensively ulcerated.

CASE 765.—Private Edmund Bettis, company D, 25th Illinois volunteers; age 28; admitted February 2, 1864. Chronic diarrhœa. [This man appears upon the register of the general field hospital of the army of the Cumberland, Chattanooga, Tennessee, admitted January 8th—diarrhœa—sent to Nashville February 1st.] Died, March 2d. *Autopsy* twenty-hours after death: Body greatly emaciated. There were slight pleuritic adhesions posteriorly, and lobular hepatization in the lower lobe of each lung; the bronchial tubes contained a good deal of pus. The heart weighed six ounces. The liver weighed two pounds ten ounces; the spleen weighed four ounces. The kidneys were healthy and weighed four ounces and a half each. The mesenteric glands were slightly enlarged. The lower portion of the small intestine was a good deal inflamed, and the large intestine was extensively and deeply ulcerated.

CASE 766.—Corporal George W. Baxter, company G, 25th Georgia, (rebel;) age 22; admitted January 2, 1864. Dropsy. Died, March 9th, of chronic dysentery. *Autopsy* twenty-four hours after death: There were a few old pleuritic adhesions on the left side posteriorly. The lungs were healthy. The heart weighed seven ounces. The liver weighed three pounds; the gall-bladder was distended with bile. The right kidney weighed five, the left six ounces. The spleen weighed seven ounces and a half. The mesenteric glands were much enlarged. The large intestine was highly inflamed and ulcerated.

CASE 767.—Private Thomas H. Benson, company K, 16th South Carolina, (rebel;) age 35; admitted January 27, 1864. Anasarca. Died, March 10th, of chronic diarrhœa. *Autopsy* thirty hours after death: The right lung was healthy; the lower lobe of the left lung was hepatized red. The heart weighed six ounces and a half. The liver weighed two pounds eleven ounces; the spleen weighed four ounces and a half. The left kidney weighed five ounces, the right four and a half. The mucous membrane of the small intestine was injected; that of the large intestine was inflamed; the rectum was ulcerated at some points.

CASE 768.—Private John Luntsford, company I, 19th Tennessee, (rebel;) age 30; admitted January 1, 1864. Chronic diarrhœa. Died, March 12th, of pneumonia. *Autopsy* twenty-four hours after death: The lower lobes of both lungs and the

lower portion of the upper lobe of the right lung were hepatized; the upper lobe of the left lung was healthy. The heart weighed nine ounces; there were fibrinous clots in both ventricles. The liver weighed three pounds four ounces and a half. The spleen weighed five ounces. The kidneys weighed four ounces and a half each. The mucous membrane of the lower portion of the small intestine was inflamed. The descending colon and the rectum were ulcerated.

CASE 769.—Private George L. Koonts, company A, 39th Indiana volunteers; age 23; admitted from Chattanooga, Tennessee, February 14, 1864. Chronic diarrhœa. Died, March 12th. *Autopsy* twenty-four hours after death: The left lung was healthy; the upper lobe of the right lung was hepatized partly red, partly gray; the lower lobe was healthy. The heart weighed six ounces and a half. The liver was somewhat fatty and weighed forty-eight ounces and a half. Both kidneys were also fatty; the left weighed seven ounces and a half, the right seven ounces. The lower third of the small intestine was intensely inflamed. [There is no record of the condition of the large intestine.]

CASE 770.—Private Thaddeus Tillotson, company D, 15th United States Infantry; age 20; admitted February 2, 1864. Chronic diarrhœa. [This man appears upon the register of the field hospital of the army of the Cumberland, Chattanooga, Tennessee, admitted January 6th—diarrhœa—sent to Nashville February 1st.] Died, March 15th, of meningitis. *Autopsy:* The superficial vessels of the brain were congested. There were three ounces of serum and some lymph at the base of the brain; the ventricles were filled with serum. There were old pleuritic adhesions posteriorly on both sides. The apex of the right lung was infiltrated with tubercles; miliary tubercles were scattered through the rest of the right lung and the apex of the left lung. The heart weighed eight ounces. The liver was softened, adherent to the diaphragm, and weighed three pounds. The spleen also adhered to the diaphragm; it weighed five ounces. The right kidney weighed five ounces, the left five and a half. [The condition of the intestines is not recorded.]

CASE 771.—Private William J. Bryan, company H, 17th Tennessee, (rebel;) age 28; admitted March 7, 1864. Chronic diarrhœa. Died, March 15th. *Autopsy* twenty hours after death: Body greatly emaciated. The lungs were healthy. The heart weighed seven ounces. The liver weighed three pounds nine ounces. The spleen weighed eight ounces. The left kidney weighed five ounces, the right four and a half. The mesenteric glands were tubercular. The lower portion of the small intestine was extensively inflamed, and the colon and rectum were ulcerated.

CASE 772.—Private William J. Henry, company I, 1st Tennessee cavalry, (rebel;) age 30; admitted from Provost Marshal February 8, 1864. Chronic diarrhœa. Died, March 21st. *Autopsy* twelve hours after death: Body greatly emaciated. There were pleuritic adhesions on the right side. The right lung was very much congested. The heart weighed six ounces. The liver weighed three pounds. The spleen was rather pulpy and weighed five ounces and a half. The right kidney weighed three ounces and a half, the left four ounces. The abdominal cavity contained about six ounces of serum, and there was a small deposit of pus over the lower portion of the bowels. The mucous membrane of the small intestine was extensively inflamed. The cæcum was very much ulcerated. In the colon and rectum there were numerous old ulcers, some of which had begun to cicatrize. There were two lumbricoid worms in the small intestine.

CASE 773.—Private Thomas Mayberry, company H, 12th Tennessee cavalry; age 43; admitted March 23, 1864. Chronic diarrhœa. Died, March 24th. *Autopsy* twenty-four hours after death: Body considerably emaciated. The right lung was adherent to the diaphragm. The bronchial mucous membrane of both lungs was inflamed, and the tubes contained a large quantity of thick mucus. The heart weighed eleven ounces. The liver weighed three pounds twelve ounces; the spleen weighed four ounces. The kidneys weighed four ounces and a half each. The stomach contained five large lumbricoid worms. The lower portion of the small intestine was very highly inflamed. Throughout the large intestine the mucous membrane was thickened, and presented innumerable superficial ulcers.

CASE 774.—Sergeant Edward R. Shepard, company M, 1st Wisconsin cavalry; age 25; admitted March 5, 1864. Chronic diarrhœa. Died, March 25th, of empyema. *Autopsy* twenty-four hours after death: There were extensive pleuritic adhesions on the right side, and deposits of lymph over the right lung; the right pleural sac contained fifty-five ounces of seropurulent fluid; the right lung was partially collapsed; the left pleural sac contained four ounces of serum; the left lung was greatly engorged but nowhere hepatized. The heart weighed eleven ounces. The liver weighed six pounds one ounce. The spleen weighed eight ounces and a half. The right kidney weighed six ounces and a half, the left seven ounces. Nothing abnormal was discovered in the intestines.

CASE 775.—Private Francis M. Gibson, company H, 5th Tennessee cavalry; age 30; admitted from Provost Marshal March 31, 1864. Typhoid pneumonia. Died, April 2d, of chronic diarrhœa. *Autopsy* twenty-four hours after death: The brain was normal and weighed forty-six ounces. The bronchial tubes of both lungs were inflamed. The heart weighed eight ounces and a half. The liver weighed three pounds. The spleen weighed ten ounces and a half. The kidneys were softer than normal; the right weighed three ounces, the left three and a half. The large intestine was ulcerated, and there were a few ulcers scattered through the small intestine.

The next seventeen cases, from HOSPITALS No. 2, 4, 6 and 14, Nashville, Tennessee, were forwarded with the report of Surgeon Ebenezer Swift, U. S. A., Medical Director of the Department of the Ohio and of the Cumberland for the year 1862. The number of the hospital is appended to each case. Thirteen of the cases are from Hospital No. 6, Surgeon Charles Schüssler, 6th Indiana volunteers, in charge.*

CASE 776.—Private Francis M. Howe, 13th Michigan volunteers; age 28; admitted June 25, 1862. This patient had marched with his regiment through Kentucky, reaching Nashville about the middle of March. He was soon after treated for

* For a special report, containing Surgeon Schüssler's views on chronic diarrhœa, see page 43 of this volume.

typhoid fever at hospital No. 1, where he was admitted April 1st, remaining until the middle of May. He was then transferred to the convalescent camp in the suburbs of the city, but complained continually of rheumatism and debility. He was finally transferred to the University hospital June 25th. At the time of admission the patient presented the appearance of a sunburnt, hearty, muscular, well-nourished man; the only visible sign of disease was considerable paleness of the tongue and of the palpebral conjunctivæ. He was ordered to take twenty drops of the tincture of the chloride of iron three times a day. July 1st: He experienced a slight chill, followed by a brief paroxysm of fever in the middle of the day. A scruple of quinine was administered July 2d, and from this time until July 11th there was no further complaint. Another slight chill, followed by fever and vomiting, then occurred, and a second scruple of quinine was administered on the next day. There were no repetitions of these chills, but on the 17th of July he complained of considerable pain in his limbs, attended with fetid perspiration. Ordered a scruple of Dover's powder in divided doses. This was followed next day by a scruple of quinine, also in divided doses. The patient now appeared to be completely relieved until the 24th of July, when he had a repetition of the fetid perspiration, but without a previous chill or fever. Ordered ten grains of Dover's powder every four hours, with four compound cathartic pills at bed-time, to be followed next day by a scruple of quinine in divided doses. July 25th and 26th: The patient expressed himself as feeling remarkably well, and performed guard duty about the premises; but during the night of July 26th he was attacked with diarrhœa, and had three light colored liquid stools during the night, followed by a fourth at breakfast-time next morning. The diarrhœa was not attended with pain or gastric uneasiness, and the appetite remained unimpaired. At 9 o'clock, when the morning visit was made, the patient complained of pains in the back and limbs, but did not mention the occurrence of diarrhœa during the previous night. Suspecting a recurrence of the malarial symptoms, a large dose of quinine was ordered to be taken immediately. This, however, was not administered. A few minutes after the departure of the medical attendant, who had remarked nothing unusual in the appearance of the patient, he received a hurried summons back to the ward, but before he could reach the place the man was dead. His companions stated that he had walked down stairs from the third story and had sat for a few minutes under a tree in the grounds of the hospital. He then returned to the ward, where he held some conversation concerning his diarrhœa, and spoke of a singular burning pain in his stomach and insatiable thirst, which was not relieved by draughts of water. He then reclined upon his bed, and was soon after seen to move his feet and jerk his head and elbows backward; his respiration at the same time became noisy, and froth appeared upon his lips. The whole cutaneous surface assumed a livid-purple color; it was moist but not cold. In less than two minutes life had departed. *Autopsy* five hours after death: Rigor mortis had not yet supervened. The whole body was warm and the skin was yet moist. The livid hue had disappeared except from the lips and nose and from the posterior portions of the body. The body was muscular and well clothed with adipose tissue. The arachnoid membrane was raised from the cerebrum by a considerable serous effusion; at the base of the brain there was not less than four ounces of fluid; the vessels of the pia mater and of the substance of the brain presented no unusual congestion; the amount of fluid in all the ventricles did not exceed three drachms. The substance of the lungs was perfectly healthy; the right lung was bound by old adhesions to the costal pleura; there was very little fluid in the left pleural cavity. The heart was healthy; its left ventricle was firmly contracted and was empty; the right ventricle contained a small colorless clot; the right auricle was immensely distended with fluid blood. The pericardium contained about five ounces of clear serous fluid. The intestines were not inflated; they contained a small quantity of thin, straw-colored, pasty substance. The color of the jejunum, as it lay in situ, was a beautiful faint rosy tint. The ileum and colon were more darkly congested. The mucous surface of the alimentary canal presented no other sign of disease, except that the solitary glands of the cæcum were remarkably conspicuous, some of them being nearly as large as a mustard-seed. The stomach presented nothing unusual. The spleen was not enlarged; its substance was firm and of a dark slate-color. The kidneys appeared to be perfectly healthy. There was no serous accumulation within the cavity of the peritoneum. The liver was full of fluid blood, which followed the knife profusely; its color was darker than normal, but not so dark as the spleen; the gall-bladder was filled with liquid yellowish-green bile. The blood was uncoagulated in the veins of the arm, as well as in those of the neck and throughout the viscera.—Acting Assistant Surgeon H. M. Lyman.* Hospital No. 2.

Case 777.—Private Henry Fay, company F, 51st Illinois volunteers; age 21; five feet nine inches and a half high, dark complexion, gray eyes, brown hair; admitted October 2, 1862. Chronic diarrhœa. The patient was much emaciated and debilitated; his bowels were disturbed as often as once an hour; the evacuations were rather small, containing blood and mucus, and were attended with much tormina. He expressed a great desire for cold drinks. His skin was dry and of a dusky hue, the surface cool, particularly the extremities; the tongue was dark brown in the center, and bright red and dry at the tip and along the sides; the pulse about 110, small and hard; respiration was natural, and the sensorial functions were unimpaired. ℞. Calomel six grains, opium three grains, ipecacuanha six grains; make four powders. Take one every three hours. Also, ℞. Sulphate of morphia two grains, tannin ten grains, mucilage two ounces. Give a tablespoonful by injection after each evacuation. Diet: Boiled rice and milk. October 3d: The evacuations are less frequent and attended with less tormina; pulse 105; other symptoms about the same as yesterday. Treatment and diet continued. October 4th: Slept well last night; seems better this morning; evacuations less frequent, color and quality more natural; tongue not so dark, tip and edges still very red; pulse 100, with a little more volume. The abdomen continues tender on pressure. Stop medicines and substitute the following: ℞. Brandy and water of each three ounces, tincture of opium one drachm, tannin ten grains, oil of cinnamon five drops. Take half an ounce every two hours. Diet as before. October 5th: Feels better; slept well; abdomen less painful; evacuations still thin and watery but less frequent; tongue the same as yesterday. Diet and treatment continued. October 6th: Is much worse this morning; evacuations very frequent, small, consist of blood and mucus, and are attended by severe tormina; abdomen very tender, particularly in the hypogastric region; tongue dry and black in the center; sensorial functions unimpaired; prostration extreme. Treatment: ℞. Brandy six ounces, water four ounces, tincture of opium a drachm and a half, creasote five drops, oil of cinnamon five drops. Take an ounce every two hours. Injections continued. Diet: Essence of beef, boiled rice and milk. October 8th: Had a very restless night; bowels moved as often as every half hour, and toward morning even more frequently;

* Dr. Lyman has published this case in the *Amer. Med. Times*, Vol. V, August, 1862, p. 110, as a case of congestive fever.

evacuations small, and consist almost entirely of blood. Stomach irritable, vomits occasionally; pulse very small and rapid, skin dusky and cold, especially the extremities; eyes sunken; sordes accumulating on the teeth, gums and lips; abdomen very tender and concave. Died, October 10th. *Autopsy* twenty hours after death: Body extremely emaciated; rigor mortis imperfectly developed; the surface was dusky, excepting along the course of the linea alba, where it was livid; no ecchymosis or purpura. Brain not examined. There were old pleuritic adhesions laterally and posteriorly on both sides, especially the left side. The lungs were normal, excepting a small part of the posterior portion of each lung, which was of a purplish hue from hypostatic congestion. The pericardium contained nearly an ounce of serum. The heart was normal. The stomach was inflated with gas; the color and consistence of its mucous membrane were natural. The spleen was enlarged, soft, and easily broken down with the finger. The liver was slightly enlarged and congested; the gall-bladder contained about an ounce of unhealthy bile. The duodenum was healthy. The upper portion of the jejunum was natural, its middle portion congested, the lower part inflamed. The ileum was highly inflamed throughout, and Peyer's glands were extensively ulcerated; the ulcers were deep and well defined, perforating the mucous coat, and surrounded by a dark-purple or almost black border. The ileo-cæcal valve was extensively ulcerated and of a dark color, almost black. The cæcum was highly inflamed but not ulcerated. The ascending colon was much inflamed, its upper portion ulcerated; the transverse colon very much inflamed and extensively ulcerated; the descending colon in much the same condition as the transverse. The sigmoid flexure and rectum were not opened. The omentum contained no fat, was much inflamed, its vessels greatly enlarged and filled with blood; the mesentery was in the same condition. The mesenteric glands were much enlarged, some of them measuring ten lines by seven. The kidneys were normal.—Assistant Surgeon Jas. F. Weeds, U. S. A. Hospital No. 4.

CASE 778.—Private Tobias Duell, company E, 19th United States Infantry; admitted October 10, 1862, with jaundice. Died, October 16th, of chronic diarrhœa. *Autopsy* fourteen hours after death: The integuments over the abdomen were livid; rigor mortis complete. There were extensive pleuritic adhesions on both sides; large tubercular deposits in the apex of the left lung; hypostatic congestion in the apices of both lungs. The heart was normal; in the left ventricle a fibrinous clot about an ounce in weight adhered to the aortic valves. The liver was bound to the diaphragm by firm old adhesions; the gall-bladder contained about an ounce of unhealthy bile. The substance of the liver was normal. The omentum contained no fat. The spleen and kidneys were normal. The upper portion of the ileum was considerably inflamed; in its middle portion there was a single well-defined ulcer. The rectum was dotted with numerous small ulcers. The mesenteric glands were enlarged and tuberculous.—Hospital No. 4.

CASE 779.—Private William B. Calkins, company E, 1st Michigan engineers and mechanics; age 37; lymphatic temperament; admitted September 2, 1862. Chronic diarrhœa. Treatment: Tonics, stimulants and astringents, with as good diet as the hospital could afford. Died, September 21st. *Autopsy:* Body extremely emaciated. The right lung was firmly adherent to the ribs and diaphragm; the left lung was normal. The pericardium contained two ounces of serum. The heart was of natural size, its left ventricle empty, the right ventricle contained a large firm polypus-like coagulum; the mitral valve was much thickened. The stomach was very small and contained two ounces of a brown extremely offensive fluid. The liver was apparently normal; the gall-bladder filled with dirty colored bile. The pancreas and spleen were normal. The mesenteric glands were somewhat enlarged. Evidences of inflammation were found in the ileum and colon; in the latter there were some gangrenous spots. The mucous membrane of the cæcum was abraded in some places, and of a dark almost black color. The kidneys, ureters and bladder were normal.—Hospital No. 6.

CASE 780.—Sergeant Thomas Powers, company E, 24th Kentucky volunteers; age 37; admitted September 19, 1862. Chronic diarrhœa. This man had frequent stools, with extreme tormina and tenesmus; his pulse was feeble and frequent; respiration hurried; tongue coated with a brownish fur; stomach irritable; urine of a deep-red color. He was but moderately emaciated and his mind was clear. Treatment: Tonics, stimulants, anodynes, counter-irritation to the abdomen, and nourishing diet. He died, October 3d, of asthenia. *Autopsy:* Body moderately emaciated; skin of a brownish tint. There were no pleuritic adhesions, and the lungs were normal with the exception of a calcareous nodule the size of a bean which was found in the middle lobe of the right lung. The pericardium contained an ounce and a half of serum. The heart and its valves were normal; both ventricles were empty; the auricles contained a small quantity of black and semi-fluid blood. The liver was large and pale, its texture firm; the gall-bladder contained a little bile. The stomach was elongated, and contained six ounces of a yellowish fluid of the consistency of syrup; its mucous membrane was of a dark liver-color, with excoriations toward the cardiac extremity; near the pylorus there were three deep ulcers two and a half to three lines in diameter. The duodenum, jejunum and upper portion of the ileum were normal; the mucous membrane of the lower portion of the ileum was red and thickened. The mucous membrane of the ascending colon was of a dark purple color and thickened; this condition extended to the transverse and descending colon, but diminished in degree toward the sigmoid flexure, where the mucous membrane again became healthy. The spleen was large; its color normal, its texture firm. The kidneys were normal. The pancreas was very large.—Hospital No. 6.

CASE 781.—Private Henry Thorncroft, company B, 15th United States Infantry; admitted October 3, 1862. Chronic diarrhœa. This patient had been sick about eight months. He was extremely emaciated; his temperature low, coldest in the extremities; his features contracted; pupils dilated; voice husky; his skin brown and shrivelled; pulse 48; respiration occasionally sighing; urine scanty and never passed without a discharge from the bowels; stools frequently involuntary. Treatment: Diffusible stimulants, wine whey, mucilaginous drinks, astringents, tonics, generous diet, frictions to extremities, warm applications to extremities and abdomen. Died, October 14th. *Autopsy* ten hours after death: Height five feet five inches; body very much emaciated. There were extensive old pleuritic adhesions on the right side. The lungs were normal. The pericardium contained an ounce and a half of serum. The heart was rather small; its left ventricle empty and contracted. The liver was large, extending into the left hypochondrium; its under surface was lead colored, its upper surface presented a number of yellowish spots the size of a dime; the gall-bladder was distended with bile. The spleen was large and soft. The omentum was small and dirty looking; its vessels engorged. There were some peritoneal adhesions. The mesenteric glands were enormously

enlarged. The pancreas was tough, dry and hard to cut. The stomach contained six ounces of dark-brown fluid, the appearance of which indicated an admixture of bile. The mucous membrane of the stomach, in both upper and lower curvatures, presented ecchymosed spots of a dark-purple color; the pyloric extremity of the stomach was normal. The mucous membrane of the small intestine was normal, except in the neighborhood of the ileo-cæcal valve, where it was ulcerated. The blood-vessels of the colon were much injected; its mucous membrane was full of ulcerations, and in patches gangrenous and sloughing. The kidneys were normal.—Hospital No. 6.

Case 782.—Private Baylor H. Sherrill, company E, 13th Kentucky volunteers; age 27; admitted September 2, 1862. Chronic diarrhœa. The patient was very much debilited by the continued discharges from the bowels. For a time the use of tonics and stimulants, together with astringents, seemed to improve his condition; but shortly after the 1st of October a change for the worse took place, and he died October 18th.—Acting Assistant Surgeon Thomas Hughes. *Autopsy:* Body very much emaciated. Height five feet eleven inches. The thoracic viscera were normal, except that the pericardium contained three ounces of serum. The liver was large; its anterior edge dark colored, its texture normal. The spleen was normal. The stomach contained from four to six ounces of a greenish-yellow slimy fluid; its mucous membrane was healthy in appearance with the exception of a few patches, some of a cinnabar red, others of a dark-blue color toward the larger curvature. The mucous membrane of the small intestine showed no traces of morbid alteration. The mucous membrane of the ascending and transverse colon was also natural; the descending colon was very much contracted, being only the size of the middle finger. The lower part of the sigmoid flexure was dark blue; its mucous membrane and that of the rectum was ulcerated and presented numerous gangrenous spots the size of a half dime. The ileum contained very little mucus. The transverse colon contained an ochre-colored fluid of the consistence of thin syrup. The mesenteric glands and the kidneys were normal.—Surgeon Charles Schüssler, 6th Indiana volunteers. Hospital No. 6.

Case 783.—Private Bartley Murphy, company K, 10th Kentucky volunteers; age 30; admitted September 26, 1862. Dysentery. His pulse was small and frequent; tongue furred in the middle, red on the tip and edges; stomach irritable; urine highly colored; emaciation considerable but not extreme. He died October 21st. This man had a low adynamic fever from the time he entered the hospital. Singultus set in about two weeks before death, and continued with intermissions until he died. An antiphlogistic and antifebrile plan of treatment was pursued. *Autopsy:* The body was greatly emaciated. Height five feet ten inches. The chest presented a number of ecchymosed spots, particularly on the left side, commencing a little above the nipple and extending to the false-ribs and the scrobiculus cordis. The lower lobe of the left lung was strongly adherent to the diaphragm; on the surface of the lung there were a number of dark lines corresponding in shape with the ribs; the upper lobe was hepatized, the lower lobe healthy; the right lung was normal. The pericardium contained about two ounces of serum. The left ventricle of the heart was empty; the left auricle contained black coagula; the right ventricle was empty; the muscular walls, especially those of the right ventricle, were soft, pale and fatty. The liver was rather large and pale; its upper surface was adherent to the diaphragm; the gall-bladder was full of bile. The spleen was normal. The stomach was enormously large, but presented nothing remarkable excepting its size. The small intestine was normal. The colon was highly inflamed throughout the greater portion of its length. The kidneys and bladder were normal.—Hospital No. 6.

Case 784.—Private Solomon Wood, company I, 1st Michigan volunteers; age 43; admitted October 20, 1862. Chronic diarrhœa. When admitted the patient had frequent slimy evacuations accompanied with tenesmus. He had a sullen sleepy appearance, spoke but little, and remained in bed in a somnolent state from which he could easily be roused. His abdomen was tender on pressure. He was moderately emaciated; pulse 60, full but compressible; respiration normal. In the treatment turpentine emulsion, mercury and chalk combined with Dover's powder, nitrate of silver in pills, &c., were administered by the mouth, and a solution of nitrate of silver used by enema, but without checking the disease. He died October 29th. *Autopsy* ten hours after death: Body moderately emaciated; skin yellowish. Height five feet five inches. The right lung was normal; its upper lobe was slightly adherent to the pleura costalis; there were no pleuritic adhesions on the left side; the left lung was hypostatically congested. The larynx, trachea and bronchial tubes were normal. The pericardium contained half an ounce of serum. The heart and its valves were normal. The arch of the aorta was unusually large. The liver was normal; the gall-bladder distended with bile. The spleen was large, soft and dark colored. The stomach was enormously distended with gas and contained a pint of dark greenish fluid; its mucous membrane was normal. The ileum presented marks of inflammation, its mucous membrane being tumid, especially near the ileo-cæcal valve, and ulcerated in many places. The mucous membrane of the large intestine was of a dark greenish color, and presented many ulcerations and gangrenous patches. The ascending colon was agglutinated to the omentum in such a way as to form several sacs filled with a yellowish turbid fluid. The mesenteric glands were enlarged. The kidneys, ureters and bladder were normal.—Hospital No. 6.

Case 785.—Private Samuel D. Case, company D, 51st Indiana volunteers; age 42; admitted October 12, 1862. Chronic diarrhœa. No previous history was obtained. When admitted the patient had profuse diarrhœa; his pulse was feeble and thread-like, from 98 to 100; the respiration slow but normal; the tongue red and clean; the urine pale. Most of the time the patient lay quietly on his left side. His skin was dry, cold, and stretched over the facial bones, giving him a cadaverous appearance. His abdomen was slightly distended; his feet œdematous. He had no appetite and was extremely prostrate. Treatment: Astringents, anodynes, stimulants and tonics, with a nourishing diet. Died, November 1st. *Autopsy* fifteen hours after death: Body extremely emaciated. The feet and ankles were œdematous; the skin yellowish-brown and parchment-like. The surface of the upper lobes of both lungs was emphysematous. The pericardium contained four ounces of serum. The heart was pale; the mitral valves thickened; the left cavities contained a good deal of dark blood of the consistency of syrup. The right lobe of the liver was strongly adherent to the diaphragm; the parenchyma of the organ was pale but otherwise normal; the gall-bladder contained a small quantity of bile. The spleen was rather small and of normal texture. Several portions of the omentum was thickened, discolored and very vascular. The stomach was very large, distended with gas, and contained a quantity of semi-transparent fluid; its mucous membrane was pale, and streaks of pus were attached to it in considerable quantity

in several places; near the pyloric extremity there was some ulceration. The ileum presented no evidences of disease except that it was much contracted in several places. The mucous membrane of the colon presented but little evidence of disease. About five inches from the ileo-cæcal valve there were several excoriations, but elsewhere it was pale and coated with a small quantity of watery mucus. The kindeys were normal.—Hospital No. 6.

CASE 785.—Private John Meister, company I, 1st Wisconsin volunteers; age 30; admitted September 19, 1862. Chronic diarrhœa of six months' duration. When admitted this patient had frequent exhausting discharges from the bowels; his pulse was very feeble and frequent. He had some dyspnœa; his tongue was pale, considerably coated, and he had very little appetite. He was in a condition of extreme debility. The treatment consisted chiefly in the use of tonics and stimulants. As a tonic the following was ordered: ℞. Tincture of the chloride of iron one ounce, infusion of serpentaria nine ounces. Take a teaspoonful three times a day. Carbonate of ammonia, beef essence and milk-punch were given regularly during the last three weeks of life. He died from asthenia, November 14th. *Autopsy* twenty hours after death: Five feet six inches high. Body moderately emaciated; feet œdematous. The heart was normal in size; the coronary veins were much engorged; the muscular tissue was in a state of incipient fatty degeneration; the right ventricle and the left auricle contained coagula; the mitral valve was thickened and discolored; the ascending portion and arch of the aorta were large. The liver was pale; the gall-bladder contained an ounce and a half of bile. The spleen was enlarged and dark, but firm. The pancreas was softened and of a dark-gray color. The stomach was large; its mucous membrane presented many excoriations and livid red spots. The mucous membrane of the ileum was tumid and discolored. At the ileo-cæcal valve were deep gangrenous ulcers which extended into the cæcum. In the mucous membrane of the colon there were large ulcers having a gangrenous appearance. The kidneys were normal.—Hospital No. 6.

CASE 787.—Private Gilbert Perry, company G, 1st Ohio artillery; age 28; admitted September 26, 1862. Chronic diarrhœa. This patient was extremely emaciated. His pulse was frequent, full, but compressible; respiration 25 to 30 per minute; tongue red but streaked with a white fur. The stools were watery, mixed with blood, extremely frequent, at times attended with tenesmus. The urine was scanty and passed with pain. The face was colorless; the abdomen exceedingly tender on pressure, particularly along the track of the colon. Various modes of treatment were tried without benefit, especially enemata intended to reach the ulcerated portion of the colon. A nutritious diet was employed, with cod-liver oil, iron and stimulants. Died, November 20th. *Autopsy* fifteen hours after death: Body extremely emaciated. The lobes of the right lung were interadherent; the upper lobe collapsed; the middle and lower lobes presented on their surface a number of elevated spots the size of a silver dollar, hard at their peripheries, soft in their centers; the bronchial tubes leading to them were obstructed; in the upper lobe of the left lung similar isolated circumscribed elevations were found; the lower lobe was partially hepatized. The heart was of normal size; the right ventricle was empty, the left contained some dark fluid blood; the tricuspid valves were thickened, and the auriculo-ventricular opening narrowed; the mitral valves were also thickened and did not close fully, thus permitting regurgitation. The stomach was normal. The liver was highly engorged with blood; the gall-bladder was full of bile. The spleen was enlarged and softened. The duodenum and jejunum were normal. The lower portion of the ileum was reddened, its mucous membrane tumefied, and in several places much discolored. Throughout the whole length of the large intestine the mucous membrane was diseased and presented many deep ulcerations, some circumscribed, others confluent; there were also a number of red velvet-like tracts of considerable size, and some spots which appeared to be gangrenous. The kidneys were large but presented no abnormal appearance. The urinary bladder contained a considerable quantity of urine.—Hospital No. 6.

CASE 788.—Private Jefferson Waits, company B, 85th Illinois volunteers; age 27; admitted November 15, 1862. Diarrhœa and heart disease. At the time of admission he made no special complaint, but expressed himself as suffering from great fatigue, lassitude and chilliness. He said he had been nearly a year in the service and had not been sick much. On being questioned he admitted that he had diarrhœa, and that for several years he had been repeatedly troubled with a cough and pain in the chest. His pulse was small and irregular, both as to the force of the beats and the duration between; respiration was normal in frequency, but interrupted by irregularities between inspiration and expiration; the tongue was red but moist; the urine copious and pale. He was moderately emaciated. There was no change in his appearance until the morning of the 24th, when he complained of feeling cold and feared he was going to have a chill. In the course of the morning, while returning from the privy, he fell over on the floor and breathed his last in a few minutes. He had all along been able to walk about the room, taking his meals in the dining-room up stairs. The treatment had been addressed mainly to his bowels, and consisted in the use of turpentine emulsion, a diarrhœa mixture containing laudanum and tincture of lavender, sulphate of quinia in repeated doses, a nourishing diet and some stimulants. *Autopsy* ten hours after death: Body moderately emaciated. Height five feet four inches. There were pleuritic adhesions on both sides. The pericardium contained four ounces of serum. The heart was large and flabby; the left ventricle greatly enlarged, its walls thickened; the mitral valves insufficient and much thickened; the left auricle was very much dilated, and the auriculo-ventricular opening was very large, evidently allowing regurgitation; the right ventricle and auricle were also much dilated, and the walls of the ventricle thickened. The liver, spleen and kidneys were normal. The mucous membrane of the stomach presented many red spots, which, toward the cardiac extremity, were of a livid purple color. The mucous membrane of the ileum also presented spots of red discoloration; that of the colon was of a dark color and tumefied.—Hospital No. 6.

CASE 789.—Private George Stofer, company I, 19th Ohio volunteers; age 21; lymphatic temperament; admitted September 19, 1862. Consumption. When admitted this patient had a quick, small, wiry pulse, and frequent short respiration. He was extremely emaciated, his features sharp, chest narrow, and abdomen retracted. He had all the usual symptoms of consumption, but complained chiefly of the accompanying diarrhœa, which was troublesome and persistent. The treatment consisted principally in the use of supporting measures. Dry cups and rubefacients gave temporary relief to the pain in the right side, which troubled the patient a good deal. The diarrhœa was treated with turpentine emulsion, astringents, &c. Stimulants and cod-liver oil were administered freely. He died November 29th. *Autopsy* eighteen hours after death: Body greatly emaciated. The lungs, pericardium and heart were glued together into a mass by firm adhesions, which were interspersed with tubercles

of all sizes; both pleural cavities contained between the adhesions a considerable quantity of serum. The mucous membrane of the bronchial tubes was reddened, but this condition did not extend above the bifurcation of the trachea. Very little of the lung-tissue was permeable to air, both lungs being full of tubercles in all stages, and containing numerous cavities, mostly filled with pus or a thick rose-colored muco-pus; some of the cavities were small, others large and sinuous; generally one or more bronchial tubes opened into them; one of the cavities had opened into the left pleural sac. The heart was small and all its valves were normal. The liver, spleen, kidneys and stomach were normal. The mesenteric glands were enlarged. The intestines, contrary to expectation, presented very little pathological change beyond some redness of the lower part of the ileum. The ileo-cæcal valve and the colon were apparently normal.—Hospital No. 6.

CASE 790.—Private William B. Armstrong, company E, 86th Illinois volunteers; age 47; was admitted November 15, 1862, with bronchitis and chronic diarrhœa. He had been sick some time before admission. His pulse was frequent and feeble; respiration hurried; tongue tremulous, red and moist. He had frequent passages accompanied with pain and tenesmus, and was much debilitated. His face was pale, features sharp, abdomen distended. He admitted having been a hard drinker. There was dulness on percussion on the right side of the chest, and the right hypochondriac region was much distended. Under treatment he rallied somewhat, was able to be about, and asked permission to visit his regiment, distant about two miles, for the purpose of attending to some important business. He returned November 20th, complaining of a sense of constriction across the chest, became delirious, and died November 30th. Treatment: Alteratives, local revulsives, expectorants and tonics. *Autopsy* eight hours after death: Body moderately emaciated. The upper lobe of the right lung was emphysematous, the lower lobe hepatized gray; the left lung was much engorged with blood. The bronchial tubes were inflamed. The pericardium contained a pint of serum. The mitral valve of the heart was insufficient, the left ventricle was empty, the left auricle filled with black coagulated blood; the right ventricle contained much coagulated blood, the right auricle a well-washed fibrinous clot. The liver was large, pale, and presented the nutmeg appearance; it weighed six pounds and a half. The mucous membrane of the stomach was inflamed. In the lower third of the ileum there was an intussusception twenty inches long. The spleen was soft and larger than normal. The kidneys were large. The colon presented no abnormal appearance.—Hospital No. 6.

CASE 791.—Private Amos Mann, company E, 30th Indiana volunteers; age 21; admitted October 8, 1862. Chronic diarrhœa. This man had been sick for some time under the care of a private family near Nashville. His pulse was small and extremely frequent; his respiration hurried, and he had a short hacking cough. His tongue was pointed, red in front, furred toward its base. He was so much emaciated as to be almost a living skeleton. He had a severe diarrhœa, a craving appetite, and an extremely irritable disposition. The treatment was tonic and palliative. He died December 1st. *Autopsy* fifteen hours after death: The right lung was partially collapsed and contained a large quantity of black pigment; when cut into a quantity of pus exuded; a still greater quantity exuded when the left lung was cut into, and in its lower lobe there was a large cavity containing pus. The pericardium contained a small quantity of serum. The heart and its valves were normal. On opening the stomach a firm tumor the size of a hazel-nut, with a central opening from which pus flowed, was seen near the pylorus. The mucous membrane was inflamed and tumid. The mucous membrane of the ileum was also inflamed, and ulcerated about the ileo-cæcal valve; Peyer's glands were thickened. The mucous membrane of the colon was inflamed and ulcerated throughout. The spleen was enormously enlarged, weighing three pounds and a half. The liver was enlarged and congested; on cutting it the blood which exuded was mingled with bile; the gall-bladder was small and empty. The mesenteric glands were enlarged. The kidneys were small but normal in appearance.—Hospital No. 6.

CASE 792.—Private Marion Garrison, company F, 51st Illinois volunteers; age 32; admitted October 20, 1862. Chronic diarrhœa and pneumonia. This patient had been sick for several weeks; has not had the cough and dyspnœa so long. He is moderately emaciated; pulse 100 and full; respiration 30 and very difficult; cannot speak above a whisper; expectorates peculiar green sputa; tongue covered with a thick white coat, red at the edges; bowels moved about once every hour; urine apparently normal; countenance anxious. There is dulness on percussion, and bronchial respiration on the right side of the chest. To take a grain each of calomel and opium every four hours, alternated with three grains each of camphor and carbonate of ammonia and two grains of ipecacuanha. A blister to the right side of the chest. Died, October 25th. *Autopsy* twelve hours after death: Height five feet nine inches and a half. Right lung in the third stage of inflammation, (purulent infiltration;) left lung normal. The pericardium contained about six ounces of serum; the portion reflected over the heart was straw colored and very soft; the muscular structure of the heart was deeply congested. The small intestine was normal. The mucous membrane of the colon and rectum was ulcerated. The mesenteric glands were enlarged.—Assistant Surgeon A. C. Wedge, 3d Minnesota volunteers. Hospital No. 14.

The next nine cases are from the case-book of HOSPITAL No. 8, Nashville, Tennessee, Surgeon William C. Otterson, U. S. V., in charge at the date of the first case; Surgeon R. R. Taylor, U. S. V., till October 3, 1864; afterward Assistant Surgeon J. A. Freeman, U. S. V.:

CASE 793.—Private John W. Dougherty, company L, 1st Wisconsin cavalry; admitted February 17, 1864. This man came into hospital suffering with chronic diarrhœa, of which he got better, but was attacked with pleuro-pneumonia February 29th. Treatment: Counter-irritants to the chest, stimulants and expectorants. Died, March 8th, at 7 A. M. *Autopsy:* The brain was not examined. The heart was normal. The right lung was firmly bound to the walls of the chest by old and strong adhesions. The left pleural sac contained about two pints of turbid fluid; the left lung was coated with recent lymph, which was easily peeled off; when cut into there exuded a reddish frothy fluid; the lung-tissue was soft and readily crushed between the fingers. Nothing abnormal was detected in the abdominal viscera.—Acting Assistant Surgeon Chas. C. Shoyer.

CASE 794.—Private Robert R. Denman, company E, 9th Michigan cavalry; age 30; admitted February 16, 1864. Chronic diarrhœa. [This man appears upon the register of hospital No. 4, Knoxville, Tennessee, admitted January 4, 1864—

chronic diarrhœa; no disposition recorded.] The patient stated that he had suffered from diarrhœa since the middle of September last; has also been troubled a great deal with piles; is very greatly emaciated; complains of cold feet. ℞. Opium one scruple, sulphate of quinia two scruples, sulphate of copper ten grains, ipecacuanha five grains; make twenty pills. Take one every four hours. Cod-liver oil to be rubbed freely over the abdomen and chest three times daily. Milk diet, milk-punch, hot toddy, warming-pan to the feet, &c. This treatment was continued with no important variation until March 6th, when he was attacked with measles. Died, March 8th, at 11 A. M. *Autopsy* twenty-three hours after death: Body of medium size, greatly emaciated. There were old, very firm pleuritic adhesions on the right side; the right lung was greatly engorged but crepitant; the lower portion of the lung contained numerous miliary tubercles; there were no pleuritic adhesions on the left side; a small portion of the upper lobe of the left lung was in the stage of gray hepatization; miliary tubercles were scattered throughout the lung. The heart was small and flabby. The liver was cirrhosed, pale, and very firmly adherent to the abdominal walls and the diaphragm; it could only be removed by careful dissection. On microscopical examination the hepatic cells were found to present the appearances of fatty degeneration. The mesenteric glands were enlarged. The mucous membrane of the large intestine and rectum was extensively ulcerated. The spleen and kidneys were apparently normal.—Acting Assistant Surgeon A. T. Johnson.

CASE 795.—Private Ausburn Cooper, company G, 89th Ohio volunteers; admitted March 12, 1864. Chronic diarrhœa. This patient was first seen by the reporter March 25th. At that time he had cough and complained of pain in the left side; his skin was hot and dry; his pulse full. There was dulness on percussion over the lower portion of the left lung. Tartar emetic in small doses was prescribed during the first day, and on the second calomel was combined with it. Under this treatment the pulse became less frequent and full, the skin moister, and the patient breathed more easily. On the afternoon of March 27th he complained of feeling drowsy and dull, said he had difficulty in collecting his thoughts, and was troubled by disagreeable dreams when he slept; his mind, however, seemed clear. Died suddenly, March 29th. *Autopsy* twenty hours after death: There was a large quantity of serum in each pleural cavity. The lower portion of the left lung was hepatized, partly red and partly gray; the lower lobe of the right lung was partially hepatized, the upper lobe congested. The pericardium contained two ounces and a half of serum. The heart was healthy. The liver had the nutmeg appearance. The spleen and kidneys were enlarged. Nothing abnormal was observed in the intestines.—Acting Assistant Surgeon L. A. Walton.

CASE 796.—Private William McGuire, recruit, 104th Ohio volunteers; admitted March 21, 1864. Diarrhœa and tonsillitis. The diarrhœa was treated with astringents and tincture of the chloride of iron; the tonsillitis with chlorate of potash internally and as a gargle. The patient was much depressed in spirits, and at all times insisted that he would die. He had twelve to fifteen loose passages daily. Subsequently he was attacked with pneumonia, which was treated on the supporting plan. Died, May 3d. *Autopsy* twenty-three hours after death: No rigor mortis. The brain was not examined. There were no pleuritic adhesions; each pleural sac contained about an ounce of serum. The lower lobe of the right lung was in the stage of gray hepatization. The heart was normal. The mucous membrane of the descending colon was thickened and congested.—Acting Assistant Surgeon Geo. E. Walton.

CASE 797.—Private Adam Schuyler, company D, 7th Pennsylvania cavalry; admitted April 22, 1864. Chronic diarrhœa. Treatment: A dose of castor oil and laudanum was given him on admission, and subsequently he took turpentine emulsion, camphor, opium and ipecacuanha in various proportions and combinations. Died, May 5th. *Autopsy* twelve hours after death: Rigor mortis marked. Brain not examined. The lungs were healthy. The heart was small but otherwise normal. There was considerable inflammation of the intestinal mucous membrane, especially in the ileum. The liver and spleen were healthy.—Acting Assistant Surgeon Jno. H. McIntyre.

CASE 798.—Private Thornton Hambright, company C, 2d East Tennessee cavalry; age 18; admitted April 20, 1864. Measles, followed by diarrhœa. This man was first seen by the reporter May 4th. He was then very feeble and emaciated; pulse quick; capillary circulation imperfect; fingers bluish and cold; scorbutic blotches upon the wrists. He had from seven to nine passages daily, which had a resemblance to pea-soup. He drank a great deal of water and his appetite was tolerable, but he vomited frequently. He expressed a great desire for fresh onions, which were supplied to him when possible. Prescribed ten drops of aromatic sulphuric acid every three hours and two teaspoonsful of Hope's mixture every two hours. Sherry wine. May 9th: Ordered, every two hours, a pill containing one-sixth of a grain of sulphate of copper and one-eighth of a grain of opium. May 11th: There were but two passages since yesterday morning. May 12th: Pulse 97; two passages. May 14th: Pulse 128. May 15th: Is evidently sinking. Died, May 16th, at 2 P. M. During the last two weeks of this man's life a peculiar harshness of voice was noticed. *Autopsy* twenty-five hours after death: No rigor mortis. The brain was normal. The mucous membrane of the larynx and trachea was of a black color, as though gangrenous, and evolved a very offensive odor. There were slight pleuritic adhesions and some hypostatic congestion of the posterior portion of the lower lobe of the right lung. The heart was normal; there was a black clot in the left ventricle, in the right a large white fibrinous clot, somewhat adherent to the columnæ carneæ, and extending into the pulmonary artery. The liver was normal; the gall-bladder contained but little bile. The kidneys were pale; the spleen normal. There were patches of congestion in various portions of the small intestine. [There is no record of the condition of the large intestine.]—Acting Assistant Surgeon Geo. E. Walton.

CASE 799.—Corporal Ezekiel Porter, company C, 81st Indiana volunteers; age 24; admitted June 11, 1864. Chronic diarrhœa. [This man appears upon the register of the Chattanooga hospital, Tennessee, admitted from his regiment May 24th—neuralgia—sent to Nashville June 10th.] When admitted he had hiccough, frequent watery evacuations, and vomited after taking food. Treatment: Opiates and astringents; fomentations and blisters to the abdomen. Died, June 19th. *Autopsy* twenty-four hours after death: There was inflammation of the mucous membrane of the stomach and almost the whole extent of the small intestine. The other viscera were not examined.—Acting Assistant Surgeon William Herbert.

CASE 800.—Private John W. Burris, recruit, 71st Ohio volunteers; age 25; admitted November 23, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital of the 3d Division, 4th Corps, admitted November 15th—

measles—sent to general hospital November 22d.] At the time of admission he was much emaciated; his tongue and teeth covered with sordes; he had no appetite; very frequent passages from the bowels, attended with pain and tenesmus; pulse frequent and feeble; tongue tremulous on protrusion; conjunctivæ injected. Treatment: Tannin, opium, stimulants, &c. Died, November 25th, at 1 P. M. *Autopsy* twenty hours after death: Thoracic viscera normal. The duodenum, jejunum and upper third of the ileum were healthy; the lower two-thirds of the ileum were highly injected; the solitary glands enlarged; one Peyer's patch was ulcerated. Near the ileo-cæcal valve were four or five old ulcerated but cicatrizing points. The mucous membrane of the cæcum was also congested and thickened; that of the colon was much thickened, of a pinkish color alternating with gray, and extensively ulcerated. The rectal mucous membrane was much thickened and covered with patches of effused blood.—Acting Assistant Surgeon H. C. May.

CASE 801.—Private Alexander McGannon, company K, 40th Illinois volunteers; age 20; admitted November 20, 1864. Chronic diarrhœa. [This man appears upon the register of hospital No. 1, Chattanooga, Tennessee, admitted November 14th—acute diarrhœa—sent to general hospital November 19th.] The patient was much emaciated; his countenance pale and anxious. He had very frequent watery passages, attended with pain and tenesmus; occasionally they were bloody, sometimes involuntary. There was retention of urine. Treatment: Small doses of opium, laudanum enemata, milk thickened with browned flour; warm fomentations to the abdomen. Died suddenly, November 27th, at 1 P. M. *Autopsy* twenty-four hours after death: Body rigid and extremely emaciated. Head and thorax not examined. The upper two-thirds of the small intestine were healthy; throughout the lower third the mucous membrane was congested in patches, and the solitary glands were enlarged. For twelve inches above the ileo-cæcal valve the surface was coated with yellow granular lymph. The cæcum was intensely congested, at some points ulcerated; its mucous membrane was of a dark coffee-color, that of the colon and rectum slate-color. All the coats of the colon were much thickened and indurated; it was extensively ulcerated, the ulcers extending through to the peritoneum, which was easily torn with the finger-nail. In the transverse colon were two perforated points half an inch in diameter, from which berry-seeds and other contents of the bowels had escaped into the abdominal cavity.—Acting Assistant Surgeon H. C. May. [Nos. 510 to 513, Medical Section, Army Medical Museum, are from this case. No. 510 is from high up in the ileum; No. 511 from near its middle; No. 512 from its lower extremity, including the ileo-cæcal valve. In each of these pieces the solitary follicles are enlarged to the size of pin-heads. In 511 and 512 a moderate quantity of pseudomembrane adheres to the mucous surface, and in 511 there is a large smooth cicatrix corresponding in size and position to a Peyer's patch. No. 513 is a portion of the descending colon, presenting a number of follicular ulcers, some of which have acquired considerable size; shreds of pseudomembrane are adherent to the mucous surface between the ulcers.]

## The next twelve cases were forwarded on special reports* from HOSPITAL No. 19, Nashville, Tennessee, Surgeon W. H. Thom, U. S. V., in charge:

CASE 802.—Private Adam Hose, company I, 76th Ohio volunteers; admitted February 2, 1864. Chronic diarrhœa. [This man appears on the hospital register of his regiment, admitted January 1st—diarrhœa; no disposition.] Died, February 5th. *Autopsy* twenty-four hours after death: Rigor mortis slight; body extremely emaciated. There was an ounce of serum

* These special reports were made on a printed blank in the following form:

U. S. GENERAL HOSPITAL, NASHVILLE, TENNESSEE,

....., 186 .

*Post-mortem examination of* ..... *a* ..... *in company* ....., .....
*Regiment U. S.* ..... *, who died in ward No.* ....., *under charge of* ..... .

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| I. | Sectio cadaveris ..... hours after death.<br>Cadaveric rigidity:<br>Degree of embonpoint:<br>Cicatrices or other marks of former wounds or diseases, and where:<br>State of body as to decomposition: | | |
| II. | HEAD ..... | Scalp .....<br>Calvarium .....<br>Meninges .....<br>Medullary substance ..... | |
| III. | CHEST ..... | Pleural cavities .....<br>Pericardium .....<br>Lungs—Tubercle .....<br>Pneumonia .....<br>Other diseases .....<br>Heart—Hypertrophy .....<br>Endocardium .....<br>Valves ..... | |
| IV. | ABDOMEN ..... | Peritoneal cavity .....<br>Solid viscera—Liver .....<br>Spleen .....<br>Kidneys .....<br>Hollow viscera—Stomach .....<br>Intestines, small .....<br>" large .....<br>Bladder and ureters ..... | |
| V. | BLOOD .....<br>URINE ..... | In veins and heart .....<br>In bladder, and before death, if known .. | |
| | REMARKS.—Under this head will be entered all abnormal appearances not under the above—all examinations of special organs, or parts, as of neck, spinal marrow, &c., &c. | | |

in the subarachnoid space, and the pia mater was slightly injected; the brain was healthy in other respects and weighed forty-five ounces and a half. There were slight pleuritic adhesions on both sides; the lungs weighed together thirty-four ounces. The heart weighed five ounces and a half; its right auricle and ventricle contained large fibrinous clots; the veins contained a small quantity of fluid blood. The liver weighed forty-eight ounces; the spleen eight and a half; the two kidneys ten ounces; all these organs appeared to be healthy. The mucous membrane of the stomach and small intestine was thickened and softened; that of the large intestine was also thickened, softened and ulcerated throughout its whole length.—Acting Assistant Surgeon James E. Marsh.

CASE 803.—Private Henry Kohntopp, company G, 59th Illinois volunteers; age 34; admitted from his regiment January 28, 1864. Chronic diarrhœa of three months' duration and acute bronchitis. Died, February 6th. *Autopsy* twelve hours after death: Rigor mortis well marked; body slightly emaciated. The brain was healthy and weighed forty-nine ounces and a half. There were strong pleuritic adhesions posteriorly on both sides. The bronchial tubes were inflamed and filled with frothy mucus. The lungs weighed together thirty-one ounces and a half. The pericardium contained six drachms of serum. The heart weighed five ounces and a half. The liver weighed forty ounces; the spleen seven; the kidneys together twelve. The stomach was healthy. The mucous membrane of the large intestine was thickened, softened and ulcerated. The bladder contained six ounces of urine.—Acting Assistant Surgeon T. H. Hammond.

CASE 804.—Private Joseph Buchanan, company A, 51st Indiana volunteers; admitted December 21, 1863. Chronic diarrhœa. [This man appears on the register of hospital No. 13, admitted December 18th—chronic diarrhœa—sent to general hospital December 21st.] At the date of admission the patient was very thin, his skin dry and furfuraceous, tongue smooth and moist, appetite tolerably good, no fever. He had tenderness on pressure over the abdomen generally, and had about six operations daily, which were very thin and of a pale-yellow color. The disease continued with slight variations until three days before death, when fever, with urgent thirst and more frequent evacuations, set in and continued until death. Died, February 10th. *Autopsy* ten hours after death: Rigor mortis slight; body much emaciated. The brain was healthy and weighed forty-nine ounces and a half. The lower lobe of the left lung was hepatized; the remainder of the lungs was congested; they weighed together fifty ounces. The pericardium contained an ounce and a half of serum. The heart was healthy but small. The blood in the heart and in the great veins was dark and fluid. The abdominal cavity contained twelve ounces of straw-colored serum. The liver weighed forty-eight ounces; the spleen seven and a half; the kidneys nine. The stomach was healthy. The mucous membrane of the small intestine was somewhat injected. The colon was deeply congested and its lower portion ulcerated. The mesenteric glands were enlarged. The bladder contained eight ounces of urine.—Acting Assistant Surgeon K. J. Semple.

CASE 805.—Private S. P. Burdine, company E, 9th Tennessee cavalry; admitted from his regiment January 29, 1864. Dysentery and remittent fever. Died, February 11th. *Autopsy* twenty-four hours after death: Rigor mortis slight; no emaciation. The pia mater was slightly congested. The brain weighed fifty-five ounces and a half. There were slight pleuritic adhesions on the right side. The lungs together weighed thirty-four ounces; the heart ten and a half. The pericardium contained ten drachms of serum. The liver and spleen were softened; the former weighed sixty-four ounces, the latter ten. The kidneys together weighed ten ounces. The mucous membrane of the stomach was slightly inflamed; that of the small intestine was inflamed, thickened and softened in places; that of the large intestine was very much inflamed and thickened. The bladder contained an ounce of urine.—Acting Assistant Surgeon James E. Marsh.

CASE 806.—Private Robert S. Knox, company I, 34th Illinois volunteers; admitted January 25, 1864. Chronic diarrhœa. [This man appears upon the register of hospital No. 4, Chattanooga, Tennessee, admitted January 7th—chronic diarrhœa—sent to general hospital January 26th.] Died, February 11th. *Autopsy* six hours after death: Rigor mortis well marked; body emaciated. The brain was normal and weighed forty-eight ounces. The lungs together weighed forty ounces; the heart nine. The pericardium contained three drachms of fluid; the blood in the heart and great veins was fluid. The liver weighed fifty-one ounces; the spleen six; the right kidney nine, the left nine and a half. The mucous membrane of the stomach and small intestine was congested; that of the large intestine was thickened, softened and ulcerated. The bladder was empty.—Acting Assistant Surgeon S. F. Selby.

CASE 807.—Private Elias Hackley, company K, 123d Illinois volunteers; admitted January 9, 1864. Chronic diarrhœa. When first seen by the reporter, February 1st, his diarrhœa was much improved, but he was considerably emaciated, enfeebled, and had more or less gastric irritability; the latter symptom became aggravated before the termination of the case, and for three or four days preceding his death vomiting ensued immediately on taking any food into his stomach. Died, February 12th. *Autopsy* sixteen hours after death: Rigor mortis well marked; body much emaciated. The brain was healthy and weighed fifty-five ounces. There were pleuritic adhesions posteriorly on both sides. Tubercles were scattered through both lungs, and a mass of crude tubercles the size of a goose-egg was found in the middle of the left lung; the lungs together weighed forty ounces. The heart weighed eight ounces; the blood contained in it and in the great veins was fluid. The liver weighed forty-eight ounces; the spleen ten and a half. The kidneys were large, pale and softened; they weighed together eighteen ounces. The mucous membrane of the stomach was much inflamed and ulcerated at the pyloric extremity: that of the small intestine was also inflamed, especially the ileum. The large intestine was inflamed and ulcerated. The bladder contained ten ounces of urine.—Acting Assistant Surgeon Wm. Stemmerman.

CASE 808.—Private William A. Shell, company E, 13th East Tennessee cavalry; admitted February 1, 1864. Chronic diarrhœa. Died, February 13th. *Autopsy* fourteen hours after death: Rigor mortis moderate; body emaciated. The brain was healthy and weighed forty-nine ounces. The lungs together weighed forty-nine ounces. The pericardium contained half an ounce of fluid. The heart weighed nine ounces and a half; it contained coagula. The blood in the great veins was fluid.

The abdominal cavity contained about five ounces of serum. The liver weighed sixty-five ounces. The spleen weighed nine ounces. The kidneys together weighed ten ounces and a half. The mucous membrane of the stomach was injected and softened. The small intestine was distended with gas. The mucous membrane of the ileum and of the commencement of the large intestine was injected; that of the lower portion of the large intestine was softened and ulcerated. The bladder contained about eight ounces of urine.—Acting Assistant Surgeon S. F. Selby.

Case 809.—Private George Seymour, company E, 15th United States Infantry; admitted January 27, 1864. Chronic diarrhœa. [This man appears on the register of hospital No. 4, Chattanooga, Tennessee, admitted January 11th—quotidian intermittent fever—sent to general hospital January 26th.] Pneumonia was developed a few days after admission, but was of a latent character, having no prominent symptoms that might not have been attributed to the diseased condition of the intestines. Died, February 16th. *Autopsy* ten hours after death: Rigor mortis moderate; body much emaciated. The brain was healthy and weighed forty-nine ounces and a half. The upper lobe of the right lung was pneumonified and adherent to the thoracic parietes; the lungs weighed together forty ounces. The heart was soft and flabby; it weighed seven ounces. The blood in the heart and large veins was dark and fluid. The abdominal cavity contained six ounces of serum. The liver weighed fifty-two ounces; the spleen eleven; the two kidneys eight. The mucous membrane of the stomach and small intestine was congested; that of the large intestine was deeply congested and thickened. The bladder contained four ounces of urine.—Acting Assistant Surgeon K. J. Semple.

Case 810.—Private Henry Dugger, company E, 13th Tennessee cavalry; admitted February 7, 1864. Chronic diarrhœa and anasarca of the lower extremities. The patient remained in about the same condition until the 12th, when he was taken with cough, pain in the chest, dyspnœa and the usual symptoms of pneumonia. Died, February 19th. *Autopsy* eighteen hours after death: Rigor mortis slight; body emaciated. The brain was healthy and weighed fifty-one ounces. There were slight recent pleuritic adhesions on the left side. The lower lobes of both lungs were in a state of engorgement; the lungs weighed together fifty-nine ounces. The heart was healthy and weighed eight ounces; its right cavities contained large well-washed clots; the blood in the great veins was fluid. The liver weighed seventy-four ounces and a half; the spleen eight ounces; the kidneys together ten ounces and a half. The lower portion of the small intestine was injected. The lower portion of the large intestine was thickened and ulcerated; some of the ulcers were cicatrizing. The bladder contained about three ounces of turbid urine.—Acting Assistant Surgeon James E. Marsh.

Case 811.—Private Levi Woodmansee, company E, 8th Indiana cavalry; admitted February 6, 1864. Chronic diarrhœa. February 22d, symptoms of peritonitis set in. Died, February 24th. *Autopsy:* The abdominal cavity contained pus. The peritoneum was coated with pseudomembrane. The mucous membrane of the intestines was similarly coated. The lower portion of the large intestine was ulcerated. The left kidney contained a number of calculi embedded in its pelvis and calyces; they were of various shapes and sizes and eighteen in number; they varied in weight from one to sixty-five grains, weighing in all a hundred and twenty-three grains.—Surgeon John W. Foye, U. S. V. [No. 593, Medical Section, Army Medical Museum, is from this case. The specimen consists of the calculi above described; they are composed chiefly of oxalate of lime mixed, however, with some phosphates.]

Case 812.—Private Hiram Gregory, company I, 12th Kentucky volunteers; admitted February 12, 1864. Chronic diarrhœa. [This man appears on the register of hospital No. 2, Knoxville, Tennessee, admitted January 16th—typhoid fever—returned to duty [!] February 3d.] The patient was greatly emaciated, could not eat anything with appetite, and had all the symptoms of chronic bronchitis besides a persistent diarrhœa. Died, February 26th. *Autopsy* seventeen hours after death: Rigor mortis well marked; body much emaciated. The brain was healthy and weighed fifty-five ounces. The bronchial tubes were inflamed. The lungs weighed together fifty-five ounces. The heart appeared to be healthy; it weighed ten ounces and contained fluid blood. The pericardium contained an ounce of fluid. The liver weighed sixty-three ounces; the spleen nine ounces; the two kidneys sixteen ounces. The mucous membrane of the stomach was congested; that of both small and large intestines inflamed and ulcerated. The bladder contained five ounces of urine. Acting Assistant Surgeon Ezra Woodruff.

Case 813.—Private Samuel Winkelpleck, 20th Ohio battery; admitted January 27, 1864. Chronic diarrhœa. [This man appears on the register of hospital No. 4, Chattanooga, Tennessee, admitted January 5th—chronic rheumatism—sent to general hospital January 26th.] Died, February 29th. *Autopsy* twenty-four hours after death: Rigor mortis slight; body not much emaciated. The brain was healthy and weighed forty-eight ounces. The lungs weighed together sixty-nine ounces; the posterior portions of the upper lobes of both were pneumonified. The heart weighed seven ounces; it was healthy, except that the walls of the right ventricle were somewhat thickened. The blood in the heart and veins was dark and fluid. The liver weighed sixty-two ounces; the spleen ten; the two kidneys twelve. The stomach was healthy. The mucous membrane of the small intestine was congested, thickened and in patches ulcerated. The lower portion of the large intestine presented numerous ulcers, some of which appeared to be cicatrizing. The urinary bladder was empty.—Acting Assistant Surgeon K. J. Semple.

The notes of the next case were forwarded, with the specimens, to the Army Medical Museum from Hospital No. 3, Murfreesboro', Tennessee, Surgeon Israel Moses, U. S. V., in charge:

Case 814.—Private Harry Myers, company H, 134th New York volunteers; admitted November 12, 1863. He had suffered from diarrhœa for six months; was much prostrated and greatly emaciated; his tongue was dry, and the discharges from the bowels were very frequent and profuse. During the first month he improved somewhat, and then began to run down. Died, December 30th. *Autopsy:* The solitary follicles of the ileum were enlarged. The colon and rectum were thickened and

ulcerated.—Assistant Surgeon W. E. Whitehead. [Nos. 197 to 200, Medical Section, Army Medical Museum, are from this case. Nos. 197 to 199 are successive portions of the ileum, exhibiting well-marked enlargement of the solitary follicles and some hypertrophy of the villi; the first and third pieces each present a large Peyer's patch, which, however, appears to be normal. No. 200 is a portion of the rectum, which exhibits a number of punched-out ulcers of the solitary follicles, several of which have extended into oval excavations of moderate size; irregular patches of pseudomembrane adhere to the mucous surface.]

The next four cases are from the TULLAHOMA HOSPITAL, Tennessee, Surgeon Benjamin Woodward, 22d Illinois volunteers, in charge:

CASE 815.—Private Eli Mangus, company F, 29th Indiana volunteers. [Date of admission not stated.] This man has been sick five months with chronic diarrhœa, for which, as he says, he took silver pills every four hours for four weeks, during which time he became a very dark color. At present the whole surface of his body is of a dark lead color, and he is much emaciated. Died, September 7, 1863. *Autopsy* twelve hours after death: The brain and its membranes, the heart and lungs were all normal. The liver was enlarged and clay colored. The small intestine was healthy. The large intestine presented large patches of ulceration. The mesenteric glands were greatly enlarged.—Surgeon Benjamin Woodward.

CASE 816.—Private John Sancraut, company G, 15th Michigan volunteers; admitted November 12, 1863. Diarrhœa. This man was brought from Elk river, where he had been sick a long time. No history of his case could be obtained, except that he had long suffered from ague. [He appears on the hospital register of his regiment, admitted September 29th—diarrhœa—returned to duty October 27th, and again admitted November 1st—acute peritonitis—sent to general hospital November 12th.] Died, November 17th, at 4 P. M. *Autopsy* eighteen hours after death: Body much emaciated. The whole of the small intestine was much inflamed. The transverse colon was gangrenous. The descending colon and rectum were extensively ulcerated. The kidneys were nearly double their normal size, and, when cut into, pus was found in all the calyces. The peritoneum presented numerous inflammatory patches and was much thickened. The spleen was at least five times its natural size, and very hard when cut. The mucous membrane of the bladder was very vascular.—Surgeon Benjamin Woodward.

CASE 817.—Private Hugh Montgomery, company K, 9th Iowa volunteers; admitted from Bridgeport, Alabama, November 31, 1863. This patient had suffered from chronic diarrhœa for several months and was very much emaciated. The stools were frequent and watery. A nutritious diet and stimulants were ordered. The diarrhœa was so far checked by treatment that there were but two or three dejections a day, but the patient gained no strength and gradually wasted away. His skin had from the first the peculiar bronzed appearance ascribed to Addison's disease. He died January 1, 1864. *Autopsy* eight hours after death: The thoracic viscera were normal. The liver and intestinal canal presented no evidences of disease. The spleen was about double the normal size. The kidneys were very much enlarged, hard, and, when cut open, had a peculiar waxy appearance. The suprarenal capsules were three times the usual size, and one of them contained a deposit which resembled tubercular matter but was harder than that deposit generally is; no tubercles were found elsewhere. The blood in all parts of the body was very thin.—Surgeon Benjamin Woodward.

CASE 818.—Private Francis M. Hunt, company G, 2d Kentucky cavalry; admitted October 26, 1863. Diarrhœa and gastritis. This man was said to have been sick a long time, but no connected history of his case could be obtained. The diarrhœa yielded to simple treatment, but the gastritis was unmanageable and increased in severity. The prominent features of his case were a moist red tongue, and uncontrollable thirst which nothing would allay. Food or the blandest drinks caused him to vomit, but the thirst was so pressing that if not closely watched he would drink anything within reach. He died February 9, 1864. *Autopsy* twenty hours after death, by Assistant Surgeon H. Pearce, 150th New York volunteers: The pyloric extremity of the stomach was highly inflamed and softened, but there was no ulceration; the limits of the inflamed portion were very distinct. [The condition of the intestines is not recorded.]—Surgeon Benjamin Woodward.

The next two cases were forwarded on medical descriptive lists from the CHATTANOOGA HOSPITAL, Tennessee, Surgeon Francis Salter, U. S. V., in charge:

CASE 819.—Private George D. Bates, company F, 11th Michigan battery; age 18; admitted March 15, 1864. Measles. The eruption in this case made its appearance March 12th; it has now partly subsided. The patient is of a scrofulous diathesis, and has severe bronchitis and diarrhœa. Ordered tonics and stimulants; light diet. March 20th: The diarrhœa continues. There is severe cough and muco-purulent expectoration. March 23d: The cough and diarrhœa continue. R. Mercury with chalk one scruple, ipecacuanha eight grains, opium three grains; make four powders. Take one every six hours. March 24th: The diarrhœa is better. The patient complains of hoarseness, and pain in the left shoulder. The cough continues, with some expectoration. Continue treatment. Apply volatile liniment to the shoulder. Beef-tea and wine. March 25th: The diarrhœa is again very troublesome; appetite poor; the cough is unchecked; the pain in the shoulder continues, and the right arm is paralyzed. The patient is very weak. To take ten drops of oil of turpentine in emulsion every three hours. Continue the other treatment. March 26th: The patient is about the same as yesterday, but rather weaker. He is unable to rouse himself; pulse 100, weak and compressible. Continue treatment, with free use of stimulants. March 29th: The diarrhœa is better. There is paralysis in the right leg as well as the right arm. Appetite poor. Continue treatment. March 31st: The diarrhœa is worse again, and the passages are numerous and very thin. He vomited a lumbricoid worm this morning. Is very weak. Discontinue the medicines. Give wine and milk-punch. April 2d: The back of the left hand is red and injected; the tongue dry, covered with a dark coat, and fissured; the right shoulder is swollen and painful; the diarrhœa continues. The patient picks at his nose and tongue; his respiration is rapid and feeble; pulse almost imperceptible. Died at noon. *Autopsy* twenty-four hours after death: Rigor mortis well marked. The membranes of the brain were injected; the brain-substance appeared

to be normal. The right pleural sac contained sixteen ounces of serum, the left pleural sac eight ounces. There were no adhesions, but the surface of the lungs was covered with unorganized lymph; the parenchyma of the lungs was healthy. The mucous membrane of the bronchial tubes was red, thickened and covered with a muco-purulent secretion. The heart was small but normal. The liver was large and white; on its superior surface there were three large white spots extending from one to three lines below the surface; the gall-bladder was full of dark colored bile. The stomach contained a quantity of dark bilious matter; its mucous surface was studded with small injected spots one or two lines in diameter, and of a blood-red color. The kidneys were large, between four and five inches long and three inches broad; there was no difference in color between the cortical and pyramidal portions; the suprarenal capsules were an inch and a half long and three-quarters of an inch broad. The mucous membrane of the large intestine was ulcerated throughout; the ulcers were largest and most numerous in the rectum, decreasing in size and number toward the ileo-cæcal valve. In the sigmoid flexure and below it there was not a square inch of mucous membrane free from ulcers; most of them had penetrated to the peritoneal coat, so that the gut gave way on the slightest tension; the ulcers were irregular in shape, with sharp well-defined edges, as if cut with a punch.—Acting Assistant Surgeon Thomas A. McGraw.

Case 820.—Private Thomas Duke, company C, 38th Ohio volunteers; age 22; admitted April 12, 1864. Chronic diarrhœa. Is much debilitated; stools frequent; appetite poor. April 18th: Notwithstanding the free use of tonics, stimulants and good nutritious food, the patient is daily growing feebler. His passages are very thin and frequent; appetite poor. Died, April 20th. *Autopsy* twelve hours after death: The brain was anæmic; there was a large quantity of serum beneath the arachnoid, and one or two small patches of organized fibrin on the superior surface of the cerebrum. There were old pleuritic adhesions on both sides. The heart and lungs were normal. The bronchial glands contained a calcareous deposit. The spleen was normal in size; on its capsule was a white spot as large as a dollar. The omentum was devoid of fat. The stomach presented indications of catarrhal inflammation. The colon was ulcerated throughout; in many places the ulcers penetrated to the peritoneum; they were largest and most numerous in the descending colon and the rectum; their edges were ragged. The other viscera were normal.—Assistant Surgeon C. F. Little, 19th Illinois volunteers.

## The next twenty cases are from the case-book of the General Field Hospital, Chattanooga, Tennessee, Assistant Surgeon Charles C. Byrne, U. S. V., in charge:

Case 821.—Private Moses Hatcher, company C, 16th United States colored troops; age 21; admitted from the field August 11, 1864. Chronic diarrhœa. Died, August 27th. *Autopsy* next day: There were firm pleuritic adhesions on both sides, especially on the right side. The right lung was congested; the upper lobe of the left lung was congested, the lower lobe hepatized. The heart, liver and kidneys were normal. The spleen was extremely small, weighing only an ounce. The mucous membrane of the small intestine was slightly congested. [There is no record of the condition of the large intestine.]

Case 822.—Emmanuel Tucker, contraband; age 15; admitted from the field July 18, 1864. Chronic diarrhœa. Died, August 27th. *Autopsy* the same day: The right lung was normal. The whole of the upper lobe and portions of the lower lobe of the left lung were hepatized. The heart, spleen and kidneys were normal. The liver contained a number of small abscesses about a quarter of an inch in diameter. No evidences of disease were discovered in the intestines.

Case 823.—John Tyler, contraband. [Date of admission not recorded.] Chronic diarrhœa. Died, August 29th. *Autopsy* the same day: The thoracic viscera were normal. The liver was very much softened. The spleen was normal. Numerous ulcers of small size were found in the intestines.

Case 824.—Private James Blair, company B, 10th Kentucky volunteers; age 28; admitted from Vining's station August 26, 1864. Enteritis. [This man appears on the register of the field hospital of the army of the Cumberland, admitted August 23d—dysentery—sent to general hospital August 24th.] Died, August 31st. *Autopsy* the same day: The lungs were normal. The heart was pale and flabby. On section the liver exuded a frothy serum. The spleen was enlarged and softened. The kidneys were generally pale but congested at points. The mucous membrane of the ileum was reddened by congestion. The mucous membrane of the colon was softened, of a dark green color, and in places had a gangrenous appearance.

Case 825.—Private James Harmon, company D, 7th Pennsylvania cavalry; age 19; admitted from Vining's station August 27, 1864. Typhoid remittent fever. [This man appears on the register of the field hospital of the army of the Cumberland, Vining's station, Georgia, admitted August 26th—diarrhœa; no disposition.] Died, September 1st. *Autopsy* the same day: The heart, lungs, spleen and kidneys were normal. The liver was enlarged and softened. The mucous membrane of the lower part of the ileum and of the colon was softened, thickened, and studded with numerous ulcers in various stages of development.

Case 826.—Private John W. Gray, company I, 8th Kansas volunteers; age 28; admitted from Vining's station August 27, 1864. Dysentery. [This man appears on the register of the hospital of the 3d Division, 4th Corps, admitted August 13th—diarrhœa—sent to general hospital August 24th.] Died, September 1st. *Autopsy* the same day: The posterior portion of both lungs was slightly congested. The aortic valves of the heart were thickened. The liver was softened. The spleen and kidneys were normal. The mucous membrane of the lower part of the ileum was reddened and studded with small isolated ulcers. The colon was thickened; its mucous membrane softened and of a green color.

Case 827.—Private Isaac Shumake, company E, 27th Illinois volunteers; age 27; admitted from Vining's station August 27, 1864. Inflammation of the bowels. [This man appears on the register of the field hospital of the army of the Cumberland, Vining's station, Georgia, admitted August 25th—bloody flux—sent to general hospital August 26th.] Died, September 2d. *Autopsy* the same day: The lungs, heart, spleen and kidneys were normal. The liver weighed fifty-eight ounces and was normal in appearance. The mucous membrane of the small intestine was reddened; that of the colon, throughout its whole extent, was thickened, softened and much disorganized.

CASE 828.—William Anderson, contraband; age 25; admitted from Vining's station August 26, 1864. Diarrhœa. Died, September 2d. *Autopsy* the same day: The posterior portion of both lungs was congested. The heart was normal. The liver was softened and presented a granular appearance. The spleen and kidneys were normal. The mucous membrane of the large intestine was much thickened, softened at points, and presented many large ulcers.

CASE 829.—Willis Marshall, contraband; age 16; admitted from Chattanooga September 4, 1864. Chronic diarrhœa. Died, September 5th. *Autopsy* the same day: The right lung was stuffed with tubercles and entirely disorganized; it was strongly adherent to the thoracic parietes. The left lung contained numerous isolated tubercular deposits. The pericardium contained eight ounces of serum. In the liver and spleen there were a number of small tubercular masses. The kidneys and intestines were apparently normal. The abdominal cavity contained twenty ounces of serum.

CASE 830.—Private W. W. Greer, company D, 49th Ohio volunteers; age 31; admitted from field hospital at Marietta, Georgia, August 29, 1864. Chronic diarrhœa. Died, September 5th. *Autopsy* next day: The posterior portion of both lungs was somewhat congested. The heart, spleen and kidneys were normal. The liver was softened. The mucous membrane of the ascending and transverse colon was thickened, softened, and presented numerous ulcers, mostly old ones.

CASE 831.—Private Robert Long, company K, 16th United States colored troops; age 16; admitted from the field July 25, 1864. Chronic diarrhœa. Died, September 8th. *Autopsy* the same day: The left pleural cavity contained thirty-six ounces of fluid. There were strong pleuritic adhesions on the right side. The left lung was covered with layers of lymph and completely hepatized, the upper lobe red, the lower lobe gray; the right lung was deeply congested. The heart was pale and flabby. The liver was congested and softened. The spleen was studded with miliary tubercles. The kidneys were softened. There were a few small old ulcers in the small intestine, some of which appeared to be healed.

CASE 832.—Private Charles Riley, company B, 124th Indiana volunteers; age 21; admitted from the field hospital at Marietta, Georgia, August 29, 1864. Typhoid dysentery. [This man appears on the register of the field hospital of the army of the Ohio, Marietta, Georgia, admitted July 22d—remittent fever; no disposition.] Died, September 8th. *Autopsy* next day: Both lungs were deeply congested and contained isolated miliary tubercles. The heart was normal. The liver was very much congested. The spleen congested and softened. The kidneys were normal. The ileum was much congested and studded with small ulcers. The large intestine was almost gangrenous, and presented a number of large ulcers, many of them two inches in length.

CASE 833.—Thomas Beck, citizen; age 38; admitted from the field September 8, 1864. Chronic diarrhœa. Died, September 10th. *Autopsy* the same day: There were strong old pleuritic adhesions on both sides. On the surface of the left lung was a patch of cartilaginous hardness two inches long by an inch wide. The heart was normal. The liver presented the nutmeg appearance and was filled with masses of cartilaginous hardness, some of which were as large as a hen's egg. The spleen was enlarged, softened and congested. The kidneys were normal. The mucous membrane of the ileum and of the large intestine was congested, softened, and presented a number of old ulcers.

CASE 834.—Andrew McKee, contraband; age 20; admitted from Vining's station August 26, 1864. Typhoid fever. Died, September 13th. *Autopsy* next day: The right lung was normal; the lower lobe of the left lung was hepatized. The heart was pale and flabby. The liver and spleen were softened. The kidneys were normal. The intestinal mucous membrane was thickened and softened. Numerous ulcers were found in the small intestine, and they were still more numerous in the large.

CASE 835.—Private Thomas Ousley, company G, 16th United States colored troops; age 23; admitted from the field September 10, 1864. Enteritis. Died, September 13th. *Autopsy* the same day: The lungs were normal. The aortic valves of the heart were thickened. The heart weighed eighteen ounces. The liver was fatty and presented a mottled appearance. The spleen and kidneys were normal. The mucous membrane of the ileum was congested and softened; that of the transverse and descending colon was very much inflamed and presented a number of ulcers, some of which had nearly perforated.

CASE 836.—Private Thomas Lake, company G, 120th Indiana volunteers; age 22; admitted from the field hospital at Marietta, Georgia, August 29, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital of the army of the Ohio, Marietta, Georgia, admitted August 17th—remittent fever—sent to general hospital August 28th.] Died, September 14th. *Autopsy* the same day: The lungs were slightly congested. The heart was normal. The liver was softened and congested. The spleen was normal. The mucous membrane of the intestines was thickened, softened and congested. Numerous ulcers were found in the small intestine.

CASE 837.—Private Eli Copple, company H, 80th Illinois volunteers; age 27; admitted from Vining's station August 27, 1864. Chronic diarrhœa. [This man appears on the register of the field hospital of the army of the Cumberland, Vining's station, Georgia, admitted August 24th—chronic diarrhœa; no disposition.] Died, September 16th. *Autopsy* next day: The lungs, heart, liver, spleen and kidneys were normal. The intestinal mucous membrane was thickened and softened, and there were numerous ulcers, especially in the small intestine.

CASE 838.—Private Willis Beanum, company B, 16th United States colored troops; age 27; admitted from the field September 15, 1864. Typhoid dysentery. [This man appears on the register of his regimental hospital admitted September 10th—dysentery—sent to general hospital September 15th.] Died, September 19th. *Autopsy* the same day: The lungs, heart, liver, spleen and kidneys were normal. The mucous membrane of the intestines was thickened, softened, and there were numerous ulcers, especially in the small intestine.

CASE 839.—Private John Delaney, company B, 16th United States colored troops; age 40; admitted from the field August 21, 1864. Acute dysentery. [This man appears upon the register of the hospital of the 1st Division, 11th Corps,

admitted August 12th—debility—sent to general hospital August 13th.] Died, September 22d. *Autopsy* next day: There were firm pleuritic adhesions on the right side. The lungs and heart were normal. The liver was softened. The spleen and kidneys were normal. The intestinal mucous membrane was generally congested, the congestion being most intense in the large intestine, where there were numerous minute points of ulceration.

Case 840.—Private Randal King, company E, 16th United States colored troops; age 20; admitted from the field September 2, 1864. Pleurisy. Died, September 23d. *Autopsy* next day: The lungs were much congested, and the left lung was bound to the thoracic parietes by recent adhesions. The heart, liver and kidneys were normal. The mucous membrane of the intestines was thickened and softened, and numerous ulcers were found in both small and large intestines.

The following case is from the case-book of the Union Hospital, Memphis, Tennessee, Surgeon John D. Brumley, U. S. V., in charge:

Case 841.—Private William C. Tallent, company M, 8th Missouri cavalry; admitted from Helena, Arkansas, October 14, 1863. Chronic diarrhœa. He was quite weak and had three or four evacuations daily. November 8th: He complained of pain in the right side of the chest, and crepitation was distinctly heard over the right lung both anteriorly and posteriorly, together with some dulness on percussion. A blister was applied. November 12th: The dyspnœa is much more severe; the pulse is weak; dulness on percussion and crepitation are observed on the left side also. A second blister was applied. Died, November 16th. *Autopsy* ten hours after death: There were pleuritic adhesions on the right side, and an effusion of two pints of serum in the right pleural sac. The lung was congested but not hepatized to any extent; its lobes were interadherent. The left lung was hepatized throughout, and there was some effusion of serum in the left pleural sac. The pericardium contained about four ounces of serum. There were large clots in the right side of the heart extending into the pulmonary vessels, a small clot in the left ventricle. The abdominal cavity contained a small quantity of serum. The mucous membrane of the lower ileum, cæcum and colon was greatly congested, dark colored, and coated with muco-purulent matter.

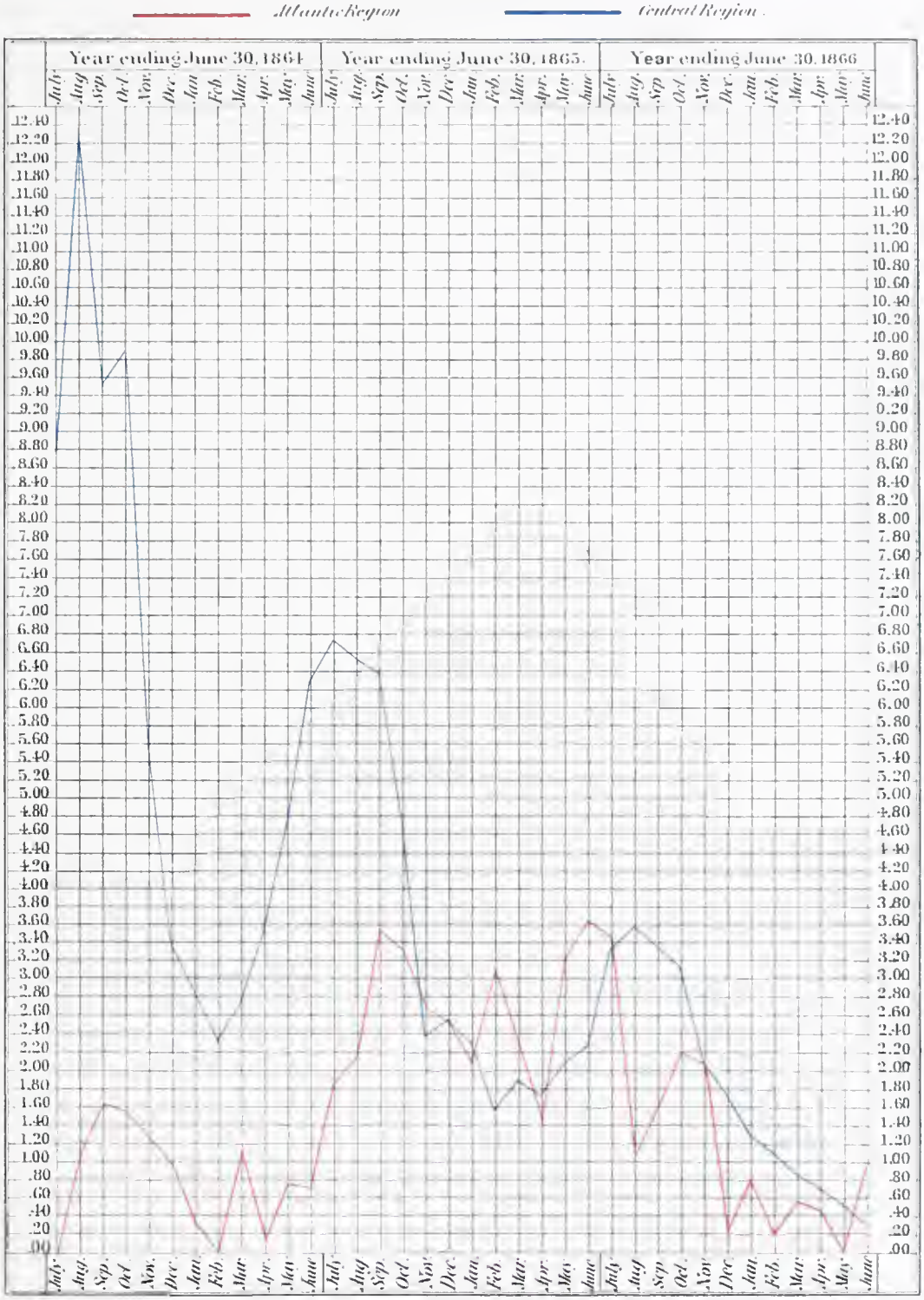
The next ten cases are from the case-book of the Natchez Hospital, Natchez, Mississippi, Assistant Surgeon A. E. Carothers, U. S. V., in charge:

Case 842.—Private Asa Wilcox, company C, 6th Michigan artillery; age 18; admitted from Morganzia, Louisiana, per steamer Laurel Hill, June 26, 1864. Chronic diarrhœa. At the time of admission this patient was debilitated and had some diarrhœa. He stated that he had suffered from diarrhœa for several months past. He was successively treated with tincture of the chloride of iron, aromatic sulphuric acid, quinine and opium, citrate of iron and quinine, &c. Stimulants were freely used. His bowels were very troublesome at times, but seemed to be easily controlled, and his general condition appeared favorable until about the middle of July, when the diarrhœa became more persistent. During the latter part of his illness his pulse was decidedly intermittent, from which some of the ward surgeons diagnosticated organic disease of the heart; others held that it was only a functional derangement. Died, August 2d. *Autopsy* fifteen hours after death: Brain not examined. The heart was perfectly normal. The posterior portion of the lungs was greatly engorged. The stomach was normal. The spleen somewhat enlarged and softened. The liver was much darker than normal and weighed four pounds and a half. The mesenteric glands were enlarged. The intestines were diseased throughout, and extensively ulcerated in the colon and rectum. This subject had a malformation of the genital organs. The penis was perfectly formed but very small; at its base was a fold of skin representing the scrotum. There was no trace of any testicle. There was no prostate gland. The mons veneris was destitute of hair, and there was no appearance of beard. No vagina, uterus or ovaries could be found. The form of the pelvis was that of a female, but the general appearance of the body was more masculine than feminine.—Acting Assistant Surgeon James S. King.

Case 843.—Private Solomon G. Milstead, company L, 1st Louisiana scouts; admitted September 26, 1864. Chronic diarrhœa. [This man appears upon the register of the Barracks hospital, New Orleans, admitted from his regiment July 8th—chronic diarrhœa—furlonghed September 19th.] Says he has been sick four months; is anæmic and greatly debilitated; complains of no pain, and is in good spirits; urine highly colored; tongue furred; pulse 120 and weak. ℞. Mercury with chalk ten grains, Dover's powder fifteen grains, sulphate of quinia ten grains; make five powders. Take one every three hours. Two ounces of milk-punch every two hours. Died, September 27th. *Autopsy* eighteen hours after death: The lungs and heart were healthy. The abdominal cavity contained two quarts of serum. The liver was very much congested and somewhat softened. The small intestine was healthy. In the large intestine there were many ulcers, a number of which had penetrated to the peritoneal coat. The ulcers were most numerous in the rectum.—Assistant Surgeon John T. Warner.

Case 844.—Private Charles Broadhogen, company A, 35th Wisconsin volunteers; age 30; admitted July 14, 1864. Chronic diarrhœa. Was first taken sick in May last, and has been variously treated without permanent benefit. He is now greatly emaciated, debilitated, and has from ten to fifteen discharges from the bowels daily. The stools are small and contain no blood. He complains of considerable tormina and tenesmus. He was treated successively by quinine and opium, aromatic sulphuric acid, bismuth and opium, &c., with wine and milk-punch. Died, September 28th. *Autopsy* twelve hours after death: The brain was not examined. The thoracic viscera were normal. The liver was light colored and flabby. The stomach was very much contracted. The spleen was enlarged and softened. The mesenteric glands were enlarged. The kidneys were healthy in appearance. There was diffused inflammation of the mucous membrane throughout the small intestine, with some well-marked circumscribed ulcers in the lower portion of the ileum. The large intestine was extensively ulcerated; the ulcers were mostly circumscribed and their edges were thickened; they appeared to have originated in the solitary glands. Besides these small ulcers there were many large, uneven and ragged ones. In many places all the coats of the intestines were destroyed with the exception of the peritoneum. The mucous membrane of the rectum was greatly thickened.—Acting Assistant Surgeon James S. King.

*Diagram showing the monthly ratio of deaths of Diarrhoea and Dysentery among Colored troops.*



CASE 845.—Private Thomas Fanck, 26th Ohio battery; age 17; admitted November 9, 1864. Chronic diarrhœa. Was very feeble, pulse 120; complains of no pain. Died, November 12th. *Autopsy* eighteen hours after death: The thoracic viscera were healthy. The liver was pale and flabby; the gall-bladder full of bile the color and consistency of warm tar. The mesenteric glands were much enlarged. The left kidney was somewhat congested. The small intestine was healthy. The cæcum was congested; its mucous membrane softened. The mucous membrane of the rectum was softened. There were no ulcers in any part of the intestines.—Assistant Surgeon John T. Warner.

CASE 846.—Private Joseph H. Nickless, company H, 35th Wisconsin volunteers; age 25; admitted July 14, 1864. Chronic diarrhœa. When admitted he was greatly debilitated, and was having from eight to ten discharges from the bowels per day. He was quite irrational, and continued to be so for about a month. Several times he escaped from his nurses, and on one occasion they found him attempting to get to the river, as he said, to drown himself. For several weeks he said every day, at the morning visit: "Well, doctor, I guess I am pretty well, but I am playing off." About August 15th he became rational, and his condition in every way seemed to be improving. About September 20th, however, he began to decline, and died November 15th. He was treated with quinine, tonics, stimulants, &c. *Autopsy* twelve hours after death: Body very much emaciated. Brain not examined. The heart and lungs were normal. The spleen was enlarged and somewhat softened. The liver pale and flabby. The mesenteric glands were enlarged. The left kidney was congested and contracted; the right kidney was normal in size but considerably congested. The stomach was normal. There was diffuse inflammation of the mucous membrane throughout the whole extent of the small intestine, and some few circumscribed ulcers were found in the lower portion of the ileum. The large intestine was extensively ulcerated; some of the ulcers were circumscribed, others ragged. The coats of the rectum were greatly thickened.—Acting Assistant Surgeon James S. King.

CASE 847.—Private C. G. Vandyke, company D, 87th Illinois volunteers; age 21; admitted November 4, 1864. Chronic diarrhœa. When admitted he was weak, emaciated, and troubled with a cough, said to be hooping-cough; the evacuations were frequent; pulse 120; he had very little appetite. Treatment: Iron, quinine and stimulants, in connection with a cough mixture. Died, November 26th. *Autopsy:* There were a few tubercles in the apex of the left lung. The heart was flabby; its auricles very thin. The liver was very much congested and softened. The left kidney was slightly congested; the right was normal. The spleen was normal. There were a few ulcers in the lower portion of the ileum. The cæcum was very much ulcerated and thickened. The rectum was extensively ulcerated; some of the ulcers had cicatrized, in consequence of which the calibre of the gut was diminished.—Assistant Surgeon John T. Warner.

CASE 848.—Private Peter Lorton, company D, 8th New Hampshire volunteers; age 22; admitted September 25, 1864. Chronic diarrhœa. When admitted the patient was anæmic and much debilitated; pulse rapid and weak; he had very little appetite. The stools numbered from fifteen to twenty in the twenty-four hours. For the first few days he was treated with mercury and chalk, opium and quinine; afterward with quinine and iron, aromatic sulphuric acid and stimulants. He improved under treatment and was able to walk around out of doors. November 1st: The diarrhœa recurred and he complained of pains in the back. After this he gradually failed, and died November 27th. *Autopsy:* The lungs and heart were healthy. The liver was very much congested. The small intestine was healthy. The large intestine was extensively ulcerated; many of the ulcers had penetrated to the peritoneal coat.—Assistant Surgeon John T. Warner.

CASE 849.—Private Samuel W. McGeary, 23th Ohio battery; age 19; admitted November 5, 1864. Chronic diarrhœa. The patient was weak, emaciated, had very little appetite, and the evacuations were frequent. He stated that he had suffered from diarrhœa for the last three months; did not complain of any pain. Treatment: Mercury and chalk, with quinine and opium for two days; afterward quinine and iron, aromatic sulphuric acid and opium, stimulants, &c. Died, November 27th. *Autopsy* twenty hours after death: The body was greatly emaciated. The lungs, heart, liver, spleen, kidneys and small intestine presented nothing abnormal. The large intestine was ulcerated throughout, the ulcers being largest and most numerous in the rectum.—Assistant Surgeon John T. Warner.

CASE 850.—Private James Campbell, company H, 87th Illinois volunteers; age 22; admitted November 4, 1864. Diarrhœa. The patient was weak and emaciated; had very little appetite. He said that he had suffered from diarrhœa four months but is at present free from it. He is very weak and has occasional convulsions. Treatment: Quinine and iron, aromatic sulphuric acid and stimulants. At first the patient appeared to improve under treatment, but had convulsions from time to time. After November 25th he began to fail, and died December 11th. *Autopsy* fifteen hours after death: The brain was normal. The lungs, heart, liver, spleen, kidneys and small intestine were healthy. The large intestine was extensively ulcerated throughout.—Assistant Surgeon John T. Warner.

CASE 851.—Private Joseph O. Jones, company B, 8th New Hampshire volunteers; age 20; admitted from his regiment November 25, 1864. Chronic diarrhœa. When admitted the patient had about fifteen stools a day; his skin was hot, dry, and presented a bilious hue; tongue furred but moist; urine highly colored. Treatment: Quinine, iron, opium, aromatic sulphuric acid, stimulants, &c. During the first two weeks the patient appeared to improve; after that he began to complain of weakness, swelling of the feet and abdomen, pain in the bowels, and the diarrhœa grew worse. During the last few days he complained of dyspnœa and preferred the upright position. Died, January 1, 1865. *Autopsy* twenty-four hours after death: Body greatly emaciated. There were firm pleuritic adhesions on the right side and the lobes of the right lung were interadherent; miliary tubercles were scattered through both lungs. The cavity of the thorax contained two quarts of serum. The diaphragm was connected with the upper surface of the liver and the lower lobes of both lungs by a deposit of coagulable lymph. The pericardium contained three ounces of fluid. The heart was healthy. The abdominal cavity contained two quarts of serum. There were extensive peritoneal adhesions. The spleen was hard and much enlarged, weighing two pounds. The liver was congested. The kidneys were small and congested. The pancreas large and firm. A firm compact morbid growth of about the color of the

pancreas, and thirteen inches in length, was found in the mesocolon of the transverse colon close to the bowel and parallel to it. It was about two inches in width and an inch thick opposite the transverse fissure of the liver, from which it gradually tapered to the under surface of the spleen, where it was adherent. From this mass a fibrous band was thrown out which encircled the colon and had greatly lessened its calibre. The small intestine was healthy. In the cæcum and colon there were a few circumscribed ulcers. The rectum was extensively ulcerated. The mesenteric glands were enlarged.

The histories of the next eight cases were forwarded, with the specimens and the accompanying letter, from HOSPITAL No. 3, Vicksburg, Mississippi. The series includes one case, that of Roberts, No. 855, in which the patient died in regimental hospital:

HOSPITAL NO. 3, VICKSBURG, MISSISSIPPI,
*December* 24, 1863.

TO THE SURGEON GENERAL OF THE ARMY.

SIR: It is proper for me, in justice to myself, to state that I am not responsible in any instance for the professional treatment of the cases herein reported. Not a single case came under my care until after the disease had become chronic, the patient greatly emaciated and enfeebled—until, I might almost add, the disease had ceased to be amenable to treatment. At the same time great pains have been taken to collect a complete history of the cases previous to coming under my observation, and this has been derived from the combined statements of the patient, his nurse and physician. I have personally made all the post mortem examinations and described all the pathological appearances with as much accuracy as was attainable under the circumstances. I have hunted up the cases in different hospitals, made the autopsies, often under very adverse circumstances, and have never been able to avail myself of the aid of the microscope; consequently, when I remark on the condition of the liver, my observations are superficial and do not involve an examination of the cell-structure; so too of the kidney and the intestine. The treatment which I have adopted for what is commonly denominated chronic diarrhœa, but which in most instances is chronic dysentery, is derived from experience and the study of the pathology of the disease. After first unloading the bowels and their distended vessels and glands by an appropriate cathartic—a saline if there is acute inflammation, blue pill or mercury with chalk if a cholagogue is indicated—the tenesmus and pain are allayed by an opiate enema. The patient is then restricted to boiled milk, poached eggs, fowl, farinaceous articles of diet, and pure wine as occasion requires. In chronic cases stimulating enemata, such as turpentine, seem rational. During the summer and fall I have treated about one hundred and fifty cases on this plan, and all those whom I have been able to subject to the above treatment, upon the first accession of the disease, have invariably, without a single exception, recovered, and many even after the disease had become chronic. The too common treatment of the disease by astringents and mercurialization should be execrated.

Very respectfully, your obedient servant,

GEORGE F. FRENCH,
*Surgeon U. S. V.*

CASE 852.—Private Helvin Ellisson, company C, 5th Minnesota volunteers; admitted October 10, 1863. Dysentery. This patient was taken sick in June with intermittent fever and diarrhœa, which some time in July ran into dysentery and brought him very low; he rallied, however, and was able to walk about for a week or two, but suffered a relapse and was brought to this hospital. At the time of admission there was considerable œdema of the lower extremities, copious bloody stools attended with moderate febrile action, and dry tongue. Subsequently the stools became dark and slimy; they never presented the white mucous or gelatinous appearance so often met with. They varied in number from five to twelve daily. The appetite, which was at first good, soon failed. He continued to lose flesh and strength and died October 31st. Treatment: Opiate and turpentine injections, chalk mixture, Tarragona wine and porter, boiled milk and farinaceous diet. *Autopsy* ten hours after death: The heart, lungs, liver, spleen and kidneys were normal. The mesenteric glands were enlarged. The entire tract of the large intestine was eroded with ulcers, and the mucous membrane was thickened, in some places to two or three lines thick; the hypertrophy was greatest in the cæcum. The ulcers were not, as in many cases, circumscribed and oval, but the whole tract had a worm-eaten aspect and the ulcers intersected each other in every direction, most of them running transversely; the majority were superficial; a few, however, almost penetrated the muscular coat. [Nos. 138 to 143, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the thickened colon, exhibiting numerous irregular ulcers, most of which are superficial and appear to have resulted from the separation of diphtheritic sloughs; scattered patches of pseudomembrane adhere to the surface of the mucous membrane between the ulcers. Nos. 138 and 139 are from the ascending, Nos. 140 and 141 from the transverse, and Nos. 142 and 143 from the descending, colon.]

CASE 853.—Private Charles C Tufts, company C, 114th Illinois volunteers; age 32; nervo-bilious temperament; occupation peddler; admitted October 12, 1863. Chronic dysentery. This man had a tendency to diarrhœa for the last seven years. Some time ago he had an attack of hæmoptysis. Had lost a brother by phthisis. Was attacked by diarrhœa in March; it continued intermittently until September 20th, when he had an attack of dysentery, passing much blood; stools from eight to fifty daily. He was delirious and had typhoid symptoms, which, however, soon passed off. At first there was much tenesmus and tormina, which injections relieved. There was considerable tenderness of the abdomen. After the first few days the stools became small, jelly-like and white, and after the first two weeks they diminished to from five to three a day. Throughout there was anorexia with great thirst, and moderate œdema of the lower extremities. November 1st: He was extremely emaciated; respiration 18 per minute; pulse 120, weak and fluctuating; tongue smooth and rather dry; slight sordes on the teeth for the last fortnight. Treatment: Injections of opium and acetate of lead; stimulants given freely from the beginning. Diet: Boiled milk, rice, farina and beef-essence. Died, November 3d. *Autopsy* twenty-four hours after death: Isolated calcified tubercles were found in the middle of the upper lobe of each lung and pleuritic adhesions at both apices. Calcified tubercles were also found in the mesenteric glands. The stomach and duodenum were normal. Dark mahogany colored patches of inflammation

were observed here and there along the whole tract of the ileum, becoming more diffuse and intense toward the cæcum, where there was a greenish discoloration and softening of the mucous membrane; the inflammation became diffuse in the ileum about two feet from the cæcum, and the mucous membrane below that point was intersected transversely by ragged elevated granulations and granular ulcerations, which increased in size and number as they approached the cæcum. One or two of Peyer's glands were studded with minute ulcers. The cæcum and ascending colon were overspread with minute points of ulceration of a dark-red color, which seems to have slightly invaded the muscular coat. The greatest amount of disease was observed in the transverse colon, where the ulcers were quite numerous, many extending almost through the muscular coat and varying in size from that of a pin-head to that of a pea; the ascending and descending colon, however, were thickened more than the transverse. The descending colon and rectum exhibited numerous elevated mahogany colored patches of inflammation, and the rectum was roughened with superficial granular ulcerations and shreddy exudations of lymph. [No. 114, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the descending colon the mucous membrane of which presents a number of follicular ulcers; some little pseudomembrane adheres to the mucous surface between the ulcers.]

CASE 854.—Private Christian Able, company F, 30th Missouri volunteers; age 35; admitted November 6, 1863. Chronic diarrhœa. September 10th, he was attacked by intermittent fever, which passed off in about a week, and was succeeded by an attack of dysentery attended with bloody stools at first numbering twenty-five or thirty daily, but diminishing in a few days to nine or ten. Latterly the stools have been small, dark colored or green, usually gelatinous, but at times frothy. Diarrhœa and dysentery have alternated. Several times the patient has been better, but shortly suffered a relapse. He has not at any time suffered much from tormina or flatulence, and his appetite has always been good until recently. His tongue is red, moist and fissured. The treatment has consisted in the use of astringents and opium, with an occasional pill of blue mass. Has never had injections. The diet has been limited to farinaceous articles, and port-wine was given as a stimulant. Died, November 10th. *Autopsy* six hours after death: Spots of purpura hæmorrhagica were noticed on the forehead, chest and abdomen; (these first appeared a day or two before death.) A few isolated calcareous tubercles and two or three cicatrices were found at the apex of the left lung; otherwise the lungs were perfectly healthy. The heart exhibited a few white fibrous patches the size of a dime on its anterior surface. The gall-bladder was rather large and full of dark-red bile; the inner coat of the gall-bladder was thickened and of a dark-orange color; its external surface was not tinged with bile as usual. The cystic duct was completely occluded for half an inch before its junction with the hepatic. The liver weighed two pounds and a quarter; the upper surface of its right lobe was slightly roughened with white fibrous deposits; the capsule of the liver generally was thickened, and presented here and there elevated white patches and striæ; it separated easily from the parenchyma of the organ, which was friable, of a deep-red color, and presented the hob-nail appearance in the upper part of the right lobe and a small portion of the posterior surface of the left lobe. The spleen was normal. The mesenteric glands were enlarged, many to the size of a horse-chestnut, and filled with a cheesy substance. At the pyloric end of the stomach the mucous membrane was deep red and soft; the same condition extended three or four inches into the duodenum, where the color was deeper and spotted with dark red points. The duodenal glands were slightly enlarged and prominent. The jejunum was of a livid red, its valvulæ conniventes tinged yellow. At the beginning of the ileum there was a thickened and broken-down Peyer's patch four inches and a half long; lower down diseased Peyer's patches were numerous; in the lower half of the ileum there were also deep-red points more or less thickly clustered together. The disease of Peyer's patches is not so extensive near the cæcum as is usual in typhoid fever. The mucous membrane of the cæcum was of a dark-red color. A few small superficial ulcers about the size of pin-heads were scattered throughout the descending colon, and half through the transverse colon, here and there were larger ulcers and a few dark colored corrugated elevations. The solitary glands of the colon appeared as numerous white points the size of pin-heads, delicately punctated in the center. The mucous membrane of the rectum was thickened and of a deep livid red with mahogany colored spots and striæ; it presented a few ulcers varying from the size of the head of a pin to that of a pea; these ulcers were most numerous in the upper part of the rectum. The contents of the small intestine were yellowish-green and frothy. The rectum was full of dark-green fæcal matter.

CASE 855.—Private Lewis Roberts, company B, 1st Mississippi volunteers; taken sick October 27, 1863, with watery diarrhœa, which, November 1st, ran into dysentery, with small bloody and mucous stools numbering at first forty a day, latterly only eight or nine. There was great tenesmus throughout, but not much tormina or flatulence. The pulse was about 100, small and feeble; the appetite good. The tongue was at first covered with a white dry fur, which passed off, and he seemed rapidly recovering, when he indulged in some improper food and suffered a relapse, with copious watery stools, and died November 12th. Treatment: In the commencement of the attack he took a moderate cathartic, which was followed by twelve grains of calomel in divided doses, combined with opium and ipecacuanha; he also had turpentine emulsion, but never any injections. Diet: Potato soup, rice and dried fruit. *Autopsy* five hours after death: The spleen was very small, about two-thirds the size of an ordinary kidney. The stomach was normal. At the beginning of the jejunum were a number of mahogany colored patches involving the entire circumference of the intestine; these patches were more extensive lower down and more intensely red in the ileum, which was very vascular but not softened; here and there the surface of the inflamed tracts presented a granular appearance. Six inches above the cæcum one of Peyer's patches was elevated, deep red and granular; a little higher up another patch, larger than the former, was softened and broken down. There was deep red inflammation of the cæcum and rectum, intersected by streaks of a deeper red color; very little ulceration was observed, and that was confined to the rectum, where there were a few small ulcers commencing in the solitary glands, which were enlarged to four or five lines in diameter, very red, elevated and broken down in the center; the lower part of the rectum was thickened and overspread with deep-red granulations.—Hospital of the 1st Mississippi volunteers, Vicksburg, Mississippi.

CASE 856.—Private James H. Rynders, company H, 4th Iowa cavalry; admitted October 10, 1863. Had diarrhœa for nine months before death. It commenced with an attack of dysentery which lasted five weeks, and began with frequent bloody stools, which in a day or two greatly diminished in number, becoming mucous and gelatinous. At the end of five weeks the

disease ran into diarrhœa, since which time diarrhœa and dysentery have alternated. November 16th: Pulse frequent and feeble; tongue dry, red and covered with a ragged white and yellowish fur. Nothing is known of his treatment up to the date of admission, since which time he has taken opium, subnitrate of bismuth in large doses, and blue mass at intervals. Porter and brandy were given freely. His diet has been almost exclusively farinaceous. Died, November 17th. *Autopsy* ten hours after death: There were a few calcareous tubercles and cicatrices in the apex of each lung; the lungs were otherwise healthy. The spleen was the size of a small kidney. There was deep vascular congestion of the duodenum and jejunum. The intestines were full of a yellowish-green fluid. At the beginning of the ileum the inflammation deepened, became diffuse, and had gone on to softening; the inflammation was not continuous, but interrupted here and there by a healthy tract a few inches long. At the lower end of the ileum a few of Peyer's patches were slightly prominent. The large intestine, with the exception of the cæcum, was thickened, cutting like cartilage. The cæcum was of a deep-red color, and its mucous coat was softened. The rest of the large intestine presented a whitish base, mottled and discolored with livid green and purple spots; the whole colon was thickly studded with small ulcers, with here and there a large one; the ulcers were deep and involved the submucous coat, to which the thickening was limited. There were also patches of adherent pseudomembrane, especially in the lower part of the colon. Some of the ulcers seemed to be healing. [Nos. 119 to 123, Medical Section, Army Medical Museum, are from this case. The specimens are successive portions of the thickened colon, presenting numerous follicular ulcers. Nos. 119 and 120 are from the ascending, No. 121 from the transverse, Nos. 122 and 123 from the descending, colon.]

Case 857.—Private William T. Beam, company E, 5th Illinois cavalry; age 21; admitted October 10, 1863. Diarrhœa. Has been in the army two years; sick for eight months. At first he had a brief attack of intermittent fever, which was succeeded by an attack of dysentery of three or four days' duration; diarrhœa supervened with watery stools, followed in a week by another attack of dysentery; subsequently the two diseases have alternated. Upon the first accession of dysentery the stools were very bloody and occurred every hour, but soon diminished, as at present, to five or ten a day. November 9th: The stools are small, shreddy, gelatinous and sometimes white; the tenesmus is very slight. Up to the first of November his appetite was capricious; since then it has entirely failed. November 15th: The tongue is moist, its surface shreddy; the pulse feeble and rapid. Died, November 19th. Treatment: Opium pills and occasionally turpentine emulsion. Since admission to this hospital he has taken chalk mixture and blue mass; as a stimulant, Tarragona wine; never had enemata until November 9th. Diet principally farinaceous. According to his statement he ate the ordinary ration up to September 20th. *Autopsy* six hours after death: The lungs were healthy but firmly bound to the thoracic parietes on all sides by old pleuritic adhesions. The mesenteric glands were dark and slightly enlarged. The spleen was rather large. The liver of a deep-red color. In the middle of the jejunum there was a tract six inches long of a livid-red color and softened; a similar tract was observed a foot farther on. The entire ileum was of a deep livid red and softened, except just above the cæcum, where the bowel appeared to be quite healthy. The solitary glands in the lower portion of the ileum were enlarged almost to the size of small shot. Peyer's glands were healthy. The cæcum was dark red and softened; the transverse colon comparatively healthy. From the beginning of the descending colon to the anus the mucous membrane was completely eroded, except here and there a few isolated elevated spots and patches; but few of the ulcers involved the muscular coat. The rectum was of a deep-red color and softened; the ulcers situated here were filled with still deeper red, adherent, grumous clots. [Nos. 145 and 146, Medical Section, Army Medical Museum, are from this case. No. 145 is from the lower portion of the ileum, and exhibits pin-head enlargement of the solitary follicles with hypertrophy of the villi. No. 146 is from the transverse colon, and presents numerous irregular ulcers such as result from the separation of diphtheritic sloughs.]

Case 858.—Private William H. Grommon, 2d Iowa battery; age 33; admitted October 10, 1863. Chronic dysentery. This man was never hardy, but has been healthier since he entered the army. Has been subject to ague for years; since entering the service has had diarrhœa occasionally; uses alcohol to excess. Was taken sick July 5th, at Big Black, with a mild attack of dysentery, but continued to walk about until the date of admission. In a short time he improved and went into convalescent camp, but had a relapse of dysentery about the first of November. The stools were at first copious and bloody, but soon became small and gelatinous, continuing so until death, November 20th. He did not suffer from flatulence or tormina, and his appetite was moderately good throughout. Treatment: Opium, tannic acid and subnitrate of bismuth were administered alternately, with an occasional dose of blue mass; never had any injections. Tarragona and port-wine were given as stimulants. Diet: Rice, farina, vegetable soup and meat. *Autopsy* twelve hours after death: The lower lobes of both lungs were hepatized partly red partly gray. The pericardium contained much serum and was roughened with soft yellow lymph. The spleen was abnormally soft, and attached to the diaphragm by its upper end with a strong fibrous adhesion, and on its free surface slightly roughened with a few ragged white fibrous shreds. In the center of its convex free surface there was a glossy white cartilaginous patch about an inch square, which in its central portion was thickest, and gradually became thinner until it shaded off into the investing membrane, of which it seemed to be merely a thickening. The kidneys were normal. The stomach was healthy. In the jejunum there were a few small tracts of moderately diffused inflammation attended by a limited degree of softening. Some similar patches of inflammation were observed in the ileum, but Peyer's patches were not involved. Inflammation of the same character was also noticed in the cæcum and ascending colon, but there was no ulceration. Superficial ulcers were sparsely scattered in the transverse colon, and increased in number and size toward the anus. The mucous membrane of the colon was livid and dark. The ulcers, which were limited to the mucous coat, had ragged, elevated, everted edges, and contained a dirty yellowish-white flocculent lymph, which, when with difficulty removed, disclosed a very deep red, smooth and glossy base. In the lower half of the colon, and more especially in the rectum, the mucous and muscular coats were greatly hypertrophied. [Nos. 129 to 131, Medical Section, Army Medical Museum, are from this case. The specimens are portions of the thickened colon, presenting a number of follicular ulcers, which, in No. 131, have for the most part extended into irregular erosions which occupy the greater portion of the mucous membrane. Pseudomembranous lymph adheres to the surfaces of the ulcers.]

CASE 859.—Corporal Daniel B. Davidson, 2d Iowa battery; age 22; admitted October 10, 1863. Chronic dysentery. July 4th: Had an attack of dysentery and passed a moderate amount of blood, suffering considerably from tormina and tenesmus; small white mucous stools succeeded, numbering about fourteen daily for awhile, but subsequently reduced in number to five or six. The last portions of these mucous stools were streaked with blood and were very offensive. In about two weeks from the commencement of the attack the stools began to partake more of the nature of diarrhœa, which has not since ceased, and at times is complicated with mild dysenteric symptoms. For two weeks in August the patient had intermittent fever, the diarrhœa continuing. October 10th: When admitted he was in a very low typhoid condition. Since admission the stools have been thin, watery and very fetid. Died, November 21st. *Autopsy* ten hours after death: There were old pleuritic adhesions on the left side. The heart was normal. The spleen was pale. There was a congenital anomaly of the liver, the left lobe being larger than the right. The kidneys were normal. There was marked vascularity throughout the small intestine, much more in some tracts than others, and greater in the ileum than in the jejunum, but there was no softening of the mucous membrane; Peyer's glands were conspicuous. The entire tract of the small intestine was studded with elevated solitary glands about the size of pin-heads, but larger in the duodenum than elsewhere; they were of the same color as the mucous coat, and delicately punctated in their centers. In the colon these glands were not elevated above the surface; their circumference was of a darker color and their centers more distinctly punctated. The transverse and descending colon and the rectum were reddened and spotted with deep mahogany colored stains, with here and there livid and dark-green tracts. There were a few follicular ulcers in the colon, and several large ragged ulcers extending transversely across the lower portion of the rectum, where also some ash-colored granulations appeared on the surface of the mucous membrane. [Nos. 126 to 128, Medical Section, Army Medical Museum, are from this case. No. 126 is a portion of the jejunum, No. 127 of the upper portion of the ileum; in both there is moderate hypertrophy of the villi, and the solitary follicles, enlarged to the size of pin-heads, project as tumors above the surface of the mucous membrane. No. 128 is a portion of the ascending colon near the cæcum, which presents a few small follicular ulcers.]

The note of the following case was forwarded to the Museum, with the specimen, from UNIVERSITY HOSPITAL, New Orleans, Louisiana, Assistant Surgeon Phineas S. Conner, U. S. A., in charge:

CASE 860.—Private George D. Knowlton, company I, 36th Massachusetts volunteers; age 25; admitted March 30, 1863. Chronic diarrhœa of many months' duration. Died, April 14th. *Autopsy:* Numerous ulcers were found in the lower three feet of the ileum and upper part of the colon as well as in the appendix. [No. 83, Medical Section, Army Medical Museum, is from this case. The specimen is the appendix vermiformis laid open and presenting a number of follicular ulcers on its mucous surface.]

The notes of the following case were forwarded to the Museum, with the specimen, from DRUM BARRACKS, California, by Surgeon S. S. Todd, 4th California volunteers:

CASE 861.—Private William A. Monier, company B, 4th California volunteers; age 35; was attacked with diarrhœa while marching with his company from Fort Mojave, on the Colorado river, Arizona territory, to Drum Barracks, California, December 11, 1863. The attack began about ten days after leaving Fort Mojave, was mild, and he continued to march for two days, when he was ordered into a wagon. The train was unprovided with medicines or a medical officer, and the first attendance he received was after reaching the city of Los Angelos on the 24th, eight days after the beginning of the attack. The diarrhœa had passed into dysentery, and bloody mucus was contained in the stools on the third day of the attack; on the seventh day retention of urine took place. On reaching Los Angelos he was visited by Acting Assistant Surgeon R. F. Hayes, who found him suffering from retention of urine, with frequent discharges of bloody mucus from the bowels, and painful tenesmus accompanied with prolapsus of the rectum. The urine was drawn off with the catheter, the prolapsus reduced, and the patient treated with opiates, mercurials and soothing enemata until the 28th of December, when he was brought to Drum Barracks, where he was first seen by the reporter. At this time he was still suffering with dysentery and retention of urine, but there was no febrile excitement, nor was there any tenderness of the iliac region on pressure. The pulse was not quite 90. Pills of opium, ipecacuanha and calomel were now prescribed, with a laudanum enema after each evacuation. (He had at this time a stool every two or three hours.) On the 1st of January, a tubular diphtheritic cast of the bowel, fourteen inches in length, was found in the patient's bed. He now slowly improved, but it was necessary to continue the use of the catheter until January 18th, when he was able to pass water without the instrument. By the 3d of February he was able to leave his bed and walk about the ward without assistance. The improvement, however, was only temporary; the flux soon recurred in the form of an obstinate diarrhœa, and he died April 25th. [No. 382, Medical Section, Army Medical Museum, is from this case. The specimen is the diphtheritic cast above described, which proved on microscopical examination to be composed of pseudo-membranous lymph in which no traces of the structure of the mucous membrane could be detected.]

The next eight cases were observed at the FREEDMAN'S HOSPITAL, Washington, D. C., during 1865, 1866, and 1867.* In none of them were the patients soldiers. Five are of interest as examples of tubercular ulceration of the intestines. Besides the specimens from these cases, several other examples of tubercular ulceration of the intestines are preserved

* During this period two of the hospital stewards on duty in the Museum, D. S. Lamb and S. S. Bond, were frequently sent to the Freedman's Hospital for the purpose of making autopsies. A considerable number of specimens illustrative of the diseases of the freedmen were thus obtained.

at the Museum, which were obtained from autopsies of colored women who died at the same hospital during the period mentioned. These are Nos. 612, 677, 678, 679, 692, 725, 776, and 798, Medical Section. Detailed accounts of these autopsies will be found in the Catalogue of the Medical Section.* In all of them extensive tubercular deposits were found in the lungs and other organs. Most of the specimens are portions of the ileum with tubercular ulcers of the mucous membrane and miliary tubercles on the peritoneal surface opposite:

CASE 862.—Stephen Green, a dark mulatto; age 31; admitted September 5, 1865. When admitted he had dulness on percussion under both clavicles, pain on pressure under the clavicles and over the stomach, and cough causing pain in the præcordial region. He was extremely emaciated and had night-sweats; his bowels were constipated; his appetite good up to three hours before death. Died, December 17th, at 10 A. M. *Autopsy* sixteen hours after death: Height five feet three inches; weight about 120 pounds; some emaciation; rigor mortis well marked. The brain weighed forty-six ounces and a half; the pia mater was congested; there was an ounce of serum in the subarachnoid space, a drachm in each lateral ventricle; the substance of the brain was soft. The cerebellum was congested, its substance very soft; the posterior fossæ of the cranium contained two ounces of serum. The upper portion of the left lung was slightly adherent to the pleura costalis; there were a number of small vomicæ throughout its upper lobe; the lung was filled with gray tubercles; it weighed twelve ounces; the upper portion of the right lung was firmly adherent, the lower portion adherent by numerous fibrinous bands; the upper lobe contained numerous vomicæ, some as large as a hulled walnut, and was filled with tubercles; the lower lobe was congested and contained many tubercles; it weighed nineteen ounces. The pericardium contained no fluid. The heart was very dark colored and congested; there was a large firm white clot in the right ventricle extending into the pulmonary artery; a similar one in the right auricle; also a small one in the left ventricle, which extended into the aorta; the valves were normal; the heart weighed eight ounces. The liver was small and congested; it presented a mottled appearance externally and was of a dark reddish brown internally. The spleen was small and shrivelled; it was of a light-blue color and weighed three ounces and a half. The right kidney was small; its cortical substance congested and fatty; it weighed three ounces; the left kidney weighed three ounces and a half and was in the same condition as the right. The mucous membrane of the stomach was thickened and slightly congested; that of the duodenum much thickened and unusually congested; that of the jejunum thickened, congested, and a few of the solitary glands ulcerated. In the upper portion of the ileum Peyer's patches were slightly ulcerated and the gut considerably congested; in the middle portion a number of the glands were ulcerated; some of the ulcers were scooped out, with rough irregular edges, others had thickened raised edges; some of the patches contained deposits of tubercles [?]; in the lower portion Peyer's patches were extensively ulcerated; near the ileo-cæcal valve the ileum was very much congested. The cæcum was filled with hard fæces, was much congested, and presented ulcers over nearly half its surface. The ascending colon was much distended at the hepatic flexure with a collection of hard fæces; the transverse colon was very large, and distended with gas to fully three inches in diameter; the descending colon was sacculated and contained a collection of hard lumpy fæces. The sigmoid flexure was distended with gas. The rectum contained lumps of hard fæces. The colon presented numerous points of ulceration throughout its whole extent, particularly at the points containing fæces, which had the appearance of having been confined for some time at these places. The bladder was small, its walls slightly thickened; it contained a small quantity of pus like fluid.—Hospital Steward Samuel S. Bond. [No. 674, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the ileum taken from near the ileo-cæcal valve, showing a Peyer's patch, which is moderately thickened and presents a considerable number of small ulcers.]

CASE 863.—Frank Williams; dark mulatto; age 14; admitted May 24, 1865, suffering from scrofulous ophthalmia. Symptoms of phthisis pulmonalis were first noticed about the middle of October. There was marked dulness on percussion on the left side beneath the clavicle and over the second, third and fourth ribs; expectoration very copious during the last four weeks; hæmorrhage occurred very profusely for the first time, February 4, 1866, about 5 P. M. The boy died in three or four minutes. Treatment: Cod-liver oil, whiskey, nourishing diet, milk-punch, etc. His diarrhœa was not troublesome except during the two or three days preceding death. *Autopsy* twenty-two hours after death: Body well formed; height four feet nine inches; some emaciation; rigor mortis well marked; weight about 80 pounds. The brain weighed forty-four ounces; its membranes were congested, its substance firm; there were two ounces of fluid in the posterior fossæ of the cranium. The right lung was firmly adherent to the pleura costalis, filled with crude tubercles and vomicæ, and weighed fifteen ounces; there were three ounces of fluid in the right pleural cavity; the left lung was firmly adherent at all points, its lobes interadherent; it weighed twenty-three ounces; in the upper lobe of the left lung was a large vomica the size of a goose egg, which was filled with coagulated blood; tubercles and smaller vomicæ were scattered throughout the lungs. The left pleural cavity contained an ounce of fluid. The bronchial glands were very much enlarged. The heart was small, slightly fatty, and weighed five ounces; all its valves were thickened. The pericardium contained eight ounces of fluid. The liver weighed forty-one ounces, was adherent at all points, its anterior surface coated with lymph; on section it was found to be very fatty and congested, presenting the nutmeg appearance, and contained some tubercles. The spleen weighed four ounces, was adherent at all points, and filled with tubercles. The pancreas and kidneys were normal; the latter weighed three ounces each. The mesenteric glands were very much enlarged. The stomach was normal. Two large tubercular ulcers were found in the ileum near the ileo-cæcal valve. The rest of the small intestine was normal. In the cæcum a few of the solitary follicles were enlarged. A large tubercular ulcer, involving the mucous and muscular coats, was found in the ascending colon; on the peritoneal surface opposite this ulcer

* Washington, Government Printing Office, 1867.

there were numerous minute tubercles; a similar but much larger ulcer was found in the transverse colon; with these exceptions the large intestine was normal. The abdominal cavity was filled with serum, and the intestines were slightly adherent to the abdominal peritoneum. The large intestine was three feet and a half long, the small intestine nineteen feet. The urino-genital organs appeared healthy.—Hospital Steward Samuel S. Bond. [Nos. 720 and 721, Medical Section, Army Medical Museum, are from this case. No. 720 is a portion of the transverse colon, showing a number of minute follicular ulcers; near the middle of the piece is a large tubercular ulcer running obliquely to the axis of the gut. On the peritoneal surface opposite the ulcer are a considerable number of minute tubercles; a few others are scattered on other portions of the peritoneal surface. No. 721 is a portion of the omentum containing a large number of minute tubercles.]

CASE 861.—John Thomas; dark mulatto; age 13; admitted January 22, 1866, with feet and legs frost-bitten to the knees. Stimulating liniments were applied and stimulants given internally; generous diet. January 28th: Mortification of the left leg has taken place, with line of demarcation half way to the knee. Amputation was performed, by Acting Assistant Surgeon A. R. Abbott, at the upper third of the left leg. The toes of the right foot sloughed off; the bones were removed by nippers. January 29th: Symptoms of jaundice. To take dilute nitric acid and fluid extract of gentian. February 23d: Symptoms of tuberculosis. Cough-mixture, milk-punch and extra diet. Died, March 28th. *Autopsy* ten hours after death: Height four feet six inches; weight about fifty pounds; much emaciation; rigor mortis well marked. The left leg exhibited a stump a few inches below the knee; all except the first phalanges of the toes of the right foot are wanting. The head was not examined. The right lung weighed twenty-four ounces; its lower lobe was firmly adherent to the pleura costalis and the diaphragm; all the lobes were firmly interadherent and contained large masses of crude tubercles; in the anterior portion of the lower lobe there was a mass of tubercle containing a cavity the size of a walnut; the posterior portion was hepatized; the left lung weighed ten ounces, was slightly adherent to the pleura costalis, and contained many tubercles; there was no fluid in the pleural cavities. The pleura costalis was dotted with numerous deposits of tubercles. The bronchial glands were much enlarged and filled with tubercles. The pericardium contained four ounces of fluid. The heart was fatty and weighed five ounces; all its cavities contained white fibrinous clots; the endocardium was thickened; there was a large deposit of adipose tissue on the surface of the organ. The liver was firmly adherent to the diaphragm, coated with lymph superiorly, and filled with tubercles; it weighed thirty-three ounces. The spleen was large and weighed seven ounces and a half; it was firmly adherent to the diaphragm and almost a mass of tubercles. The pancreas weighed two ounces and a half; it was apparently normal. The stomach was contracted, its mucous membrane thickened. There were tubercular ulcers throughout the small intestine, particularly in the lower portion of the ileum, where Peyer's patches were ulcerated through to the peritoneal coat. The cæcum and upper portion of the large intestine exhibited healed ulcers; the rectum contained a number of large ulcers which were covered with pseudomembrane. The kidneys were congested and weighed three ounces and a half each. The bladder and genital organs were normal.—Hospital Steward Samuel S. Bond. [Nos. 771 to 773, Medical Section, Army Medical Museum, are from this case. No. 771 is a portion of the small intestine from just above the ileo-cæcal valve, showing tubercular ulceration of the last Peyer's patch and of several of the solitary follicles. There are a few small tubercles on the peritoneal surface corresponding to the ulcers. No. 772 is a portion of the rectum, with patches of superficial ulceration coated with thick pseudomembrane. No. 773 is the right lung of the same patient, infiltrated with large cheesy masses of yellow tubercles.]

CASE 855.—Robert Franklin; mulatto; age 33; admitted February 3, 1866. Consumption. Nothing of special interest was developed in the progress of the case. Died, March 29th. *Autopsy* twenty hours after death: Height six feet; approximate weight 160 pounds; a stout muscular man; rigor mortis well marked; no emaciation; abrasions on the lower extremities. The brain weighed forty-eight ounces; its membranes were slightly congested; there were four drachms of fluid in each lateral ventricle; the choroid plexus was congested, the pineal gland enlarged and contained calcareous deposits; the substance of the brain was slightly softened; the cerebellum was also somewhat softened; in the posterior fossæ of the cranium there was half an ounce of fluid. The right lung was coated with croupous lymph, congested, and contained much crude tubercle and a few vomicæ; its lobes were firmly interadherent; it weighed twenty ounces; there were six ounces of fluid in the right pleural cavity; the left lung was slightly adherent to the diaphragm, its lobes interadherent; its lower lobe was hepatized, its upper lobe congested; the lung contained a small amount of tubercles; it weighed thirty-five ounces; the left pleural cavity contained four ounces of fluid. The pericardial sac contained five ounces of serum. The heart was large and covered with an excessive amount of adipose tissue; its valves were very dark and congested; the organ was very fatty and weighed thirteen ounces; the aorta atheromatous. The liver weighed seventy-six ounces; its upper surface was normal in color, its lower surface dark-green and contained a few miliary tubercles; the gall-bladder was empty. The spleen contained a small quantity of tubercles, was very firm, and weighed fourteen ounces. The pancreas was of a greenish color and very soft; it weighed five ounces. The kidneys were very fatty and weighed eight ounces each. The mucous membrane of the stomach was thickened. The duodenum and jejunum were normal. The ileum presented a number of large scooped-out tubercular ulcers; on the peritoneal surface opposite the ulcers were deposits of tubercle. The cæcum and vermiform appendix exhibited a few tubercular ulcers. In the ascending and transverse colon there were a few scooped-out ulcers with irregular edges, which penetrated to the peritoneal coat. The large intestine was eight feet long, the small intestine thirty-three feet. The abdominal parietes were of a dark-greenish color.—Hospital Steward Samuel S. Bond. [No. 774, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the ileum with several large ulcers; the villi around the edges of the ulcers are hypertrophied. There are tubercular deposits on the peritoneal surface corresponding with the ulcers.]

CASE 863.—James Evans; light mulatto; age 20; admitted May 3, 1866, between 10 and 11 A. M. No diagnosis. Died, May 4th, at 8 A. M. *Autopsy* twenty-eight hours after death: A well-formed man; height six feet; weight 150 pounds; rigor mortis partial; some ecchymoses; body covered with copper-colored spots. The brain weighed forty-eight ounces, its membranes were much congested; there was a drachm of fluid in each lateral ventricle; the membranous lining of the ventricles and the choroid plexus were congested. There were a few spicula of bone in the walls of the longitudinal sinus; the membranes of

the cerebellum were very much congested; the entire substance of the brain was soft, and there was much effusion beneath the arachnoid. In the posterior fossæ of the cranium there were two ounces of serum. The right lung weighed thirty-six ounces and was adherent at all points, its lobes interadherent; the upper and middle lobes contained vomicæ and were filled with crude tubercles; the lower lobe was congested and also contained tubercles; the left lung weighed twenty-six ounces; there were numerous vomicæ and tubercular deposits throughout; it was connected by firm adhesions to the pleura costalis. Each pleural cavity contained four ounces of fluid. The heart weighed twelve ounces; there were adipose deposits on its surface and clots in all its cavities. The liver weighed seventy-nine ounces and was very fatty; the gall-bladder contained half an ounce of bile. The spleen was lobulated, pale slate color externally, reddish internally; it weighed nine ounces. The pancreas weighed four ounces and was apparently normal. The kidneys were fatty; they weighed five ounces each. The stomach and duodenum were congested. The remainder of the small intestine and all of the large intestine exhibited extensive tubercular ulceration, with deposits of tubercle on the peritoneal surface opposite the ulcers. Length of large intestine four feet and a half, small intestine twenty feet.—Hospital Steward D. S. Lamb. [Nos. 808 and 809, Medical Section, Army Medical Museum, are from this case. No. 808 is a portion of the ileum, showing tubercular ulceration of two large Peyer's patches and several solitary follicles; the peritoneal surface opposite the ulcers presents a number of tubercles. No. 809 is the calvarium of same patient, showing a number of flattened reticulated osteophytes on its inner surface.]

Case 867.—George Washington; negro; age 50; admitted August 2, 1866. Chronic diarrhœa. Died, August 4th. *Autopsy* six hours after death: Rigor mortis marked; no emaciation; height five feet two inches and a half; weight about 135 pounds; has lost the last two phalanges of the middle, ring and little fingers of the left hand, (old stumps.) The subarachnoid fluid was unusually abundant. The brain weighed forty-seven ounces and a half; the venous sinuses contained black coagula. There were scattered tubercles in both lungs, with adhesions posteriorly, especially on the right side; the right lung weighed thirteen ounces and a half, the left lung ten ounces. The heart weighed ten ounces and a half; the walls of its left ventricle were hypertrophied, the edges of the tricuspid valve thickened; both sides of the heart contained fibrinous clots. There were extensive peritoneal adhesions. The liver was hard, rounded, and contained a number of metastatic foci in its right lobe; it weighed fifty-six ounces and a half; the gall-bladder was distended with bile. The spleen was very small, its Malpighian bodies distinct. The pancreas was light colored and weighed two ounces. The small intestine was healthy. The colon was thickened and extensively ulcerated, with elevated patches of pseudomembrane between the ulcers. The kidneys weighed five ounces and a half; the cortical substance of both had a waxy appearance; the pyramids were pinkish red.—Assistant Surgeon E. Bentley, U. S. A. [No. 849, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon which is much thickened, and presents extensive jagged ulcers from the edges of which the mucous membrane hangs in shreds; there is some adherent pseudomembrane between the ulcers.]

Case 868.—William Cole; age 45; admitted June 22, 1867. Chronic diarrhœa. The patient was debilitated, his appetite poor and digestion impaired. He had suffered from pleurisy a short time before admission. Died, July 20th. *Autopsy* ten hours after death: Rigor mortis well marked; height five feet ten inches; weight 114 pounds. Pleuritic adhesions existed over the entire external surface of the right lung, the lobes of which were interadherent; there was a melanotic nodule in the middle lobe and some congestion of the lower lobe; slight adhesions were also observed between the lobes of the left lung, and there were a few small melanotic nodules in its lower lobe. The heart was normal; all its cavities contained clots. Forty-five ounces of straw-colored serum were found in the abdominal cavity. All the abdominal viscera were glued together by firm old peritoneal adhesions. The mesentery and the mesocolon were œdematous. The liver exhibited intralobular congestion, and there was a cicatrix on the upper surface of its right lobe. The spleen was dark-red, its capsule easily detached, its Malpighian bodies prominent. The stomach was healthy. The small intestine pale. The mucous membrane of the colon was ulcerated. The sigmoid flexure of the colon extended transversely across the sacro-lumbar articulation into the right iliac fossa, the extreme point of the bend being firmly attached to the cæcum; the mesocolon corresponded in its attachment to this abnormal position. The kidneys presented a number of small superficial cysts.—Hospital Steward D. S. Lamb. [No. 891, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the thickened colon with follicular ulcers, some of which have extended into erosions of moderate size; pseudomembranous shreds hang in fringes from the edges of the ulcers.]

Case 869.—Richard Tibbs; negro; age 20; admitted November 7, 1863. Died, July 27, 1867. *Autopsy:* Height five feet eight inches; weight 90 pounds. The right lung weighed fifteen ounces; its middle lobe contained a number of miliary tubercles; the left lung weighed seventeen ounces and presented several tubercular cavities. The aorta was atheromatous. The follicles of the duodenum were prominent. The mucous membrane of the ileum was congested; its solitary follicles enlarged; Peyer's patches ulcerated. The mucous membrane of the large intestine was congested and presented minute follicular ulcers and patches of pseudomembrane.—Hospital Steward D. S. Lamb. [No. 969, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the colon with pin-head ulcers of the solitary follicles and pseudomembranous frosting.]

The histories of the ten following cases were forwarded to the Museum, with the specimens, since the close of the war, by the medical officers whose names are attached:

Case 870.—Private John Churn, company D, 2d United States colored troops; admitted to Harewood hospital, Washington, D. C., January 11, 1866. Typhoid fever. Died, January 12th, at 6 P. M. *Autopsy* forty hours after death: A well-formed negro man, five feet six inches high; weight 130 pounds; slightly emaciated; a large triangular scar on the right thigh about an inch above the knee; rigor mortis well marked. The veins of the pia mater were finely congested; the pia mater readily separated from the convolutions of the brain; the substance of the brain was firm; the lining membrane of the lateral ventricles

was opaque and appeared to be slightly softened; about two drachms of serum were found in each lateral ventricle; the fornix was slightly softened, the choroid plexus very pale; the pineal gland contained a small amount of calcareous matter; the cerebellum was large, its membranes finely congested; there was an accumulation of about three ounces of pinkish serum in the posterior fossæ of the cranium; weight of the brain was not obtained. At the base of the left lung there was a small amount of crude tubercle; the upper lobe was slightly congested, otherwise the lung was normal; the upper lobe and the posterior portion of the inferior lobe of the right lung were slightly congested; the middle lobe was apparently healthy; about three ounces of serum were found in each pleural cavity. The pericardial sac contained about two ounces of clear yellow serum. The heart was very large and flabby; it was dark colored and presented on its surface numerous dark spots, apparently ecchymoses; there were large white fibrinous clots in all the cavities of the heart, ramifying through the pulmonary artery, the aorta and their branches; the tricuspid and mitral valves were somewhat thickened, the aortic valves atheromatous, the columnæ carneæ pale. The liver was large, of a dark bronze color, very firm, and slightly congested; the gall-bladder filled with bile. The spleen was normal in size and very firm, of a dark purple color externally, dark brown internally. The right kidney was very small and fatty; the left was larger than normal, being about three times the size of the right kidney; it was congested and very fatty. The ureters showed no abnormal condition. The omentum was firm, dark and congested; it was contracted into a band. The pancreas was large, very firm, and of a dark color. The stomach, near the cardiac orifice, was much congested; its mucous membrane slightly thickened. The mucous coat of the duodenum was thickened, its upper portion much discolored with bile; near the pylorus the solitary follicles were slightly enlarged. The mucous membrane of the jejunum was slightly thickened and congested. The ileum was covered with pseudomembrane, particularly its lower portion; in the upper portion Peyer's patches were slightly thickened, in the lower portion they presented a few points of commencing ulceration. The mucous membrane of the cæcum and colon was coated with pseudomembrane, greatly thickened, and presented a number of large but superficial ulcers. The urinary organs appeared healthy.—Hospital Steward Samuel S. Bond. [Nos. 698 and 699, Medical Section, Army Medical Museum, are from this case. No. 698 is a portion of the ileum near the ileo-cæcal valve, thickened and roughened by adherent pseudomembrane. No. 699 is a portion of the rectum much thickened; its mucous membrane presents large ulcers and patches of adherent pseudomembrane; between the large ulcers are numerous minute follicular ulcers. It will be observed that the case was really one of dysentery.]

CASE 871.—Recruit Martin Kuster was struck by lightning during a violent thunder storm, while standing under or against a poplar tree near his post on Governor's Island, New York harbor, September 14, 1866. The left side of his cap was torn open, the facing of the metal button of that side thrown off; the hair of the left temple and behind the ears singed and burnt; the left boot was torn widely open from the outside seam forward and upward, and the stocking within it torn, while the right boot was torn open by two small rips in front of the outside seam and about an inch apart, one above the other. No other external marks were observed. His coat was buttoned closely about him; none of its buttons, nor those of his vest or pants, were affected. *Autopsy* sixteen hours after death: A stout muscular man. Some slight purplish stasis was observed at the back part of the neck; partial rigor of the arms, admitting a limited motion at the shoulder and elbow joint; the fingers were quite rigid, as were also the lower extremities; the skin of the left temple and behind the ear was singed away; a faint dull-yellow or amber-colored line extended from half way down the left side of the neck forward to the sternal end of the clavicle, thence irregularly double downward on the left of the median line of the chest over the sternum, more irregularly down the abdomen, passing to the left of the umbilicus, and becoming indistinct just before reaching the hair of the pubes, which was burnt over the middle of the ramus of the left pubis and upon the left side of the scrotum. This yellow line became again distinct upon the inner side of the thigh in a direction downward and backward, was lost over the popliteal space, became again distinct by burnt hairs on the back of the left calf, passed then to the outside and forward to the front of the external malleolus, where it ended. A similar but fainter burnt line of hairs could be traced on the back of the right calf, passing also downward, outward and forward to terminate in front of the external malleolus of that side. A little blood oozed from the left ear. There was some very slight stasis at the lower part of the back. The pupils were widely dilated. The adipose tissue beneath the skin of the chest and abdomen was abundant. On dissection beneath the lines mentioned no change in the fat or on the inside of the cutis vera was observed. The scalp was quite free from blood. No fracture of the skull was found. The subarachnoid space contained no excess of fluid. The longitudinal sinus was noticeably free from blood. Opposite the left parietal protuberance over the two lower convolutions of the parietal lobe, between the fissures of Rolando and Sylvius, there was a marked effusion of blood beneath the membranes; considerable serum was found in the lateral ventricles and in the spinal membranes; the substance of the brain and the choroid plexus appeared to be normal. The trachea was injected and lined with white glistening frothy mucus nearly a quarter of an inch thick. The lungs were dilated, filling the thoracic cavity; the right lung was perfectly free, the left had old pleuritic adhesions posteriorly. There was no effusion into the pleural sacs. The heart was large and fatty, its right cavities filled with black blood. There was much fat at the apex of the heart and at the base of the right ventricle; a white opaque spot was observed on the front of the left ventricle. The intestines were much distended with air, the stomach only moderately so. The stomach was partly filled with food; its rugæ were reddened; at the posterior part of its cardiac end blackened and thinned by post mortem digestion. Partly digested food of a yellowish cream-like appearance was found in the entire length of the small intestine. (He had his supper over an hour before death.) Peyer's patches near the ileo-cæcal valve were reddened so as to be visible externally, somewhat thickened, and slightly honey-combed. The solitary glands were enlarged, especially at the lower end of the ileum. The colon contained normal yellow fæces. The spleen was black and friable, but without fluid blood. The gall-bladder was almost entirely empty. The liver contained some fluid blood, but not a great deal; the bladder was half filled with urine.—Assistant Surgeon W. C. Miner. [Nos. 854 and 855, Medical Section, Army Medical Museum, are from this case. No. 854 is a portion of the ileum presenting a somewhat thickened Peyer's patch and pin-head enlargement of the solitary follicles. No. 855 is a portion of the colon with a number of minute follicular ulcers. The condition of the intestine is similar to that observed in patients who have suffered from slight diarrhœa; but there is no record that this man ever had that disease.]

CASE 872.—Private William Collins, company A, 13th United States Infantry; age 22; single; admitted to post hospital, Fort Shaw, Montana territory, October 11, 1867. Chronic dysentery and abscess of the liver. This man had suffered from attacks of dysenteric diarrhœa and had been on the sick report off and on all summer. During this time he was under the care of Acting Assistant Surgeon R. B. Hitz, U. S. A., and was treated sometimes with pills of camphor and opium, at other times with pills containing each two grains of sulphate of copper and one of opium, three times daily. As a rule he soon got better under this treatment, and returned to duty temporarily, soon to suffer a new attack. He was of temperate habits, and stated that he had heretofore uniformly enjoyed perfect health. At the date of admission into post hospital private Collins was somewhat emaciated; he had frequent watery stools streaked with blood, considerable fever, much thirst, dry furred tongue, and tenderness of the abdomen with pain especially in the left iliac region, and a craving appetite. The functions of the heart, lungs and kidneys were well performed; pulse about 100 and rather weak. Treatment: Enemata containing tannic acid or acetate of lead, with quarter of a grain of sulphate of morphia internally three or four times during the twenty-four hours; also neutral mixture from time to time, and mustard poultices to the abdomen when the pain was very severe. Milk diet, &c. The substitution of opium, with or without astringents, internally, instead of sulphate of morphia, and the omission of the neutral mixture, comprised the treatment up to October 30th. By this time he was evidently weaker, more emaciated than when first admitted, and complained of considerable pain over the right lobe of the liver, which felt smooth and somewhat hard to the touch, with considerable tenderness. ℞. Tincture of catechu half an ounce, aromatic spirits of ammonia a drachm and a half, compound spirits of lavender two drachms and a half, sulphate of morphia one grain and a half, brandy three drachms; mix. Take two teaspoonfuls four times a day, and once or twice at night if necessary. November 3d: Enema of half a grain of sulphate of morphia at night. Previous treatment discontinued. No improvement. Dejections frequent, especially at night; they are watery and tinged with blood; pulse about 100 and weak; there is much pain over the region of the liver; countenance anxious; is much emaciated. November 4th: To take an acetate of lead and opium pill three times a day, and one or two opium pills at night if the bowels are very troublesome. November 6th: Quarter of a grain of sulphate of morphia, to be repeated as may be necessary. November 9th: A grain opium pill three times a day and once at night. During all this time his diet was supporting; he had eggs when they could be obtained, milk-punch, beef-steak, farina, toast, &c., in as great variety as possible to suit his appetite, which had become exceedingly capricious. November 21st: ℞. Tincture of iodine, tincture of opium, tincture of camphor, of each twenty drops, chalk mixture half an ounce, water one ounce. The whole to be taken three times a day and once at night. November 22d: Continue treatment. November 23d: Continue treatment except one-half the quantity of tincture of iodine. November 24th: Continue treatment. November 25th: Continue treatment without the iodine, which was omitted because it commenced to irritate the stomach. Under the iodine treatment the frequency of the stools was somewhat lessened temporarily, but on the whole perhaps this treatment rather injured the patient. I heard Surgeon E. Swift, U. S. A., speak in the highest terms of his success with the use of tincture of iodine in chronic affections of the bowels, and thought best to give it a trial in this case. November 28th: Substitute an acetate of lead and opium pill three times a day and once at night, and give half an ounce of porter whenever desired. November 29th: An opium pill four times a day. Porter continued. The patient prefers porter to any other stimulant. He is evidently failing, and has become emaciated; the stools are frequent. He complains a great deal of pain over the liver and in the left iliac region. Is not jaundiced. December 4th: To take two grains of quinine three times a day; also, three times a day, a pill containing two grains of acetate of lead and half a grain of opium. The patient had for several days appeared a little more comfortable on alternate days, conveying the idea of periodicity; hence the quinine was administered, but with no appreciable benefit. December 7th: Is evidently near his end. Can hardly be induced to take any nourishment. December 9th: Died at 1 A. M., exhausted and emaciated almost to a skeleton. He was not at any time jaundiced. *Autopsy* ten hours after death: The lungs and heart were normal. The right lobe of the liver was the seat of a large abscess, and on the upper surface of the lobe there was a loss of structure beneath the peritoneum, forming a shallow cup-shaped excavation three or four inches in transverse diameter and half to three-quarters of an inch deep; this excavation was filled with pus and communicated with the main cavity of the abscess in the center of the lobe. The mucous membrane of the whole length of the colon was extensively eroded and ulcerated; all the coats were much thickened and altered in structure, so that a section presented a gelatinous appearance; at intervals the tube was much contracted. The peritoneal coat appeared to have been perforated by the ulcers in two or three places just above the sigmoid flexure; the perforations were well closed by strong adhesions resulting from local peritonitis; it was difficult to dissect out the bowel in this region, as the adhesions were quite extensive and well organized. The spleen contained great numbers of small hard nodules [metastatic foci?]. The remaining abdominal organs were apparently healthy.—Surgeon F. L. Town, U. S. A. [Nos. 971 and 972, Medical Section, Army Medical Museum, are from this case. No. 971 is a portion of the colon with many oval and irregular ulcers which invade the muscular coat; there are also several cicatrices. No. 972 is a portion of the liver containing the abscess-cavity described above.]

CASE 873.—Private John Crowley, company G, 6th United States Infantry; admitted to post hospital, Charleston, South Carolina, July 3, 1867. Chronic diarrhœa. Died, November 30th. *Autopsy* eight hours after death: The intestinal canal was found to be inflamed and ulcerated throughout its entire extent. The other organs of the abdomen were healthy.—Assistant Surgeon J. C. G. Happersett, U. S. A. [No. 990, Medical Section, Army Medical Museum, is from this case. This specimen is a portion of the thickened transverse colon which presents numerous follicular ulcers.]

CASE 874.—Musician Ernst Kretschmar; age 39; admitted to post hospital, camp Grant, near Richmond, Virginia, December 24, 1867. Chronic dysentery and consumption. This man had dysentery or diarrhœa since early in October. He was admitted to hospital October 14th suffering with acute diarrhœa, and as he had then only two to four stools in the twenty-four hours, and the hospital was over-full at the time, he was returned to quarters after three days, and ordered to report daily at sick-call. When readmitted, December 24th, he presented the physiognomy of a consumptive, but, in reply to questions, declared that he had no cough, only occasionally a little phlegm in his throat; but that he had a bad diarrhœa, which was most trouble-

some at night. There were from six to eight thin yellow watery stools in the twenty-four hours. He was extremely emaciated and had but little appetite. Although his diarrhœa (or dysentery, as it doubtless was) had continued ever since his discharge from hospital, he had not reported at sick-call or had any medical treatment, and gave no reason for remaining away. Examination of his chest revealed dulness on percussion over the upper part of the right lung and mucous rales on both sides, most prominently above. He said that he had never had hæmoptysis. To take a pill of tannin and opium every two hours; also a tablespoonful of cod-liver oil three times a day. Special diet. December 25th: Five stools in the last twenty-four hours. Continue treatment. December 26th: Four stools. Continue treatment. December 27th: Sleeps badly; sputa scanty but thick and yellow. Continue the cod-liver oil. Substitute for the tannin and opium pills a grain pill of opium every three hours. December 29th: Continue cod-liver oil. Omit pills. December 30th: The diarrhœa is worse. He had nine thin watery yellow stools in the last twenty-four hours. To take a tannin and opium pill every two hours. Eight ounces of milk-punch daily. December 31st: Diarrhœa diminished. Continue treatment. January 1, 1868: Does not like the milk-punch; gave four ounces of sherry-wine instead. Continue pills every three hours, and the cod-liver oil. January 2d, 3d and 4th: Patient is failing. Treatment continued. January 5th: Exhales a peculiar sickly odor somewhat like that in typhus fever. Continue treatment except the pills. Body to be anointed with glycerine, and after four hours to be washed with warm soap and water. January 6th: Continue cod-liver oil and wine. Special diet. January 7th and 8th: Continue treatment. Died, January 9th. *Autopsy* eight hours after death: Very firm old pleuritic adhesions existed on both sides; they were extensive on the left side, and on the right coextensive with the pleura, and held the lungs closely in contact with the thoracic parietes. The upper lobe of the left lung was somewhat studded with miliary tubercles; the lower lobe had a few scattered here and there through its substance; the upper lobe of the right lung was infiltrated with white and yellow tubercles, its apex was in fact solidified by them, except that there was a sinuous cavity of an ounce or two capacity in its posterior part; the middle lobe also contained many tubercles, but still freely admitted air everywhere; there was a small cavity at the contiguous surfaces of the middle and upper lobes, and a very small one near the lower lateral margin of the lower lobe. Five or six of the bronchial glands were tuberculous. The heart was small, empty and flabby; the walls of the left ventricle were rather thin; those of the right ventricle were exceedingly thin, in some places scarcely thicker than the blade of a table-knife. An oval spot the size of a ten-cent piece was seen on the mucous membrane of the lesser curvature of the stomach, apparently a healed ulcer. The mucous membrane of the jejunum was much injected; the rest of the small intestine was healthy. A dozen to twenty large irregular ulcers were found in the colon, a few of them apparently in the process of healing; most of them, however, had jagged excavated edges.—Assistant Surgeon John H. Bartholf, U. S. A. [Nos. 922 and 923, Medical Section, Army Medical Museum, are from this case. No. 922 is a portion of the cæcum and ascending colon; No 923 a portion of the transverse colon; each presents several large irregular granulating ulcers, some of which have partially cicatrized.]

CASE 875.—Charles Gray; mulatto; said to have been a soldier, afterward an officer's servant; admitted to the Washington Asylum, D. C., May 1, 1868. Shortly after admission he received a slight wound over the right supraorbital ridge, followed by symptoms of tetanus, from which, however, he recovered. In the following November, after going about barefoot and being otherwise exposed, he was attacked with pneumonia, and died November 11th. He had no symptoms of any abdominal disease while in hospital, but is supposed to have suffered from diarrhœa during the war. *Autopsy* ten hours after death: Body well developed; rigor mortis well marked; there was a cicatrix on the right side of the forehead. The entire left lung was completely consolidated; the left pleura was coated with a well-defined layer of coagulated lymph; the left pleural sac contained nearly a pint of straw-colored liquid; the right lung was normal. The pericardium contained an ounce of fluid. The heart was normal, with the exception of an opaque spot on the external surface of the right ventricle. A number of well-defined cicatrices were found over the entire surface of the large intestine.—Assistant Surgeon E. Bentley, U. S. A. [No. 1003, Medical Section, Army Medical Museum, is from this case. The specimen consists of a portion of the colon, showing several cicatrices.]

CASE 876.—Private Thomas H. Jones, company F, 5th United States artillery, was being treated for acute diarrhœa when I took charge of the hospital at Fort Adams, Rhode Island, in August, 1870, and improved so much that in September he went home on furlough. After his return he was again admitted to hospital and treated for boils about the anus. These suppurated and the pus burrowed, forming long sinuses, which were laid open. The exposed surfaces did not granulate; the patient became anæmic, lost appetite, and had occasional diarrhœa. Though he had no cough I suspected tuberculosis, as both his parents had died of phthisis. On an examination of his chest the physical signs confirmed my suspicions. He was put on cod-liver oil in small doses combined with opium, but it produced diarrhœa and had to be stopped. He continued to improve and grow worse alternately, each change setting him back a little, until about six weeks before his death, when severe diarrhœa set in which nothing would check, and he died, frightfully emaciated, March 6, 1871. *Autopsy:* There were tubercles in both lungs, and in one of them a small cavity. The liver was much enlarged. Tubercular ulcers were found throughout the ileum. The mesenteric glands were enlarged and cheesy.—Assistant Surgeon W. E. Waters, U. S. A. [Nos. 1076 and 1077, Medical Section, Army Medical Museum, are from this case. No. 1076 is a portion of the ileum presenting on its mucous surface several tubercular ulcers; on the peritoneal surface opposite each ulcer there are a number of minute tubercles. No. 1077 is a group of the enlarged mesenteric glands.]

CASE 877.—Private Henry Fischer, company G, 5th United States cavalry; age 31; admitted to the post hospital, camp Apache, Arizona territory, June 21, 1872. He was a man of large proportions, five feet ten inches in height, with well-developed muscular limbs and apparently great powers of endurance. Though not addicted to habitual intoxication, he was a steady hard drinker, and ate proportionately little food. For several weeks previous to his coming to the post surgeon for treatment he had been working very hard, under the hot Arizona sun, building adobe houses, and had suffered all this time from an exhausting diarrhœa; furthermore, for fear of being placed on sick-report and thereby losing his extra-duty pay, he had neglected to come to the hospital for advice, and had allowed his symptoms to continue unchecked, becoming in consequence weaker and worse, until the interruption of the work of building gave him an opportunity to come up for treatment. On admission he was in a

condition of general debility, with loss of appetite, soft and compressible pulse, no fever, tongue clean and dry, and frequent watery discharges from the bowels, but no abdominal pains. He stated that he had not suffered pain of any consequence since the beginning of his illness, and did not remember having passed blood with the stools at any time. The treatment ordered was rest in bed, beef-tea, milk-punch three times a day, and small frequently repeated doses of laudanum, combined the first day with a little castor oil, and subsequently with wine of ipecacuanha. This treatment was kept up five days without amelioratiog the symptoms. On the contrary he became weaker, the diarrhœa more frequent and so harassing as to deprive him of sleep at night. On the 26th the laudanum was discontinued, and a combination of tincture of catechu and chalk mixture substituted. This also proved unavailing, and the watery discharges were so frequent during the following night as to call him out of bed every few minutes. About 3 P. M. on the 27th he began to sink rapidly and to lose power over the sphincters. Frequent stimulation with brandy, ammonia and laudanum was kept up until midnight, but without perceptible effect. He died toward 2.30 A. M. on the 28th. *Autopsy* eight hours after death: Rigor mortis well marked; emaciation moderate. The stomach was healthy and filled with the different fluids which the patient had taken the day before, but which had not been absorbed. The small intestine, and the colon as far as the sigmoid flexure, were healthy, with the exception of a few spots of mild inflammatory injection here and there; the mucous membrane, however, looked flabby and bloodless. The sigmoid flexure of the colon and the rectum were covered with innumerable ulcers, increasing in size from above downward; in the lower part of the rectum the muscular coat was exposed, and what was left of the mucous membrane hung in small shreds; the diseased surface extended nearly two feet from the sphincter ani upward. The liver was somewhat enlarged, but nothing abnormal was detected in the other abdominal organs.—Assistant Surgeon J. B. Girard, U. S. A. [No. 1158, Medical Section, Army Medical Museum, is from this case. The specimen is a portion of the descending colon; a large portion of its mucous membrane is destroyed apparently by the diphtheritic process; in the remaining islets of mucous membrane there are a number of follicular ulcers.]

Case 878.—Sergeant Peter Low, company B, 14th United States Infantry, *en route* from Fort Laramie, Wyoming territory, on sick leave; admitted to post hospital, Fort D. A. Russell, Wyoming territory, September 23, 1872. Chronic diarrhœa. The patient was said to have been intemperate. He was extremely emaciated and slightly jaundiced. He complained of occasional pain referred to the left hypochondrium, and physical examination indicated considerable enlargement of the liver. He died October 1st. *Autopsy:* The brain and spinal cord were not examined. The thoracic viscera were normal. The liver was greatly enlarged and adhered to the intestines and right kidney; in the right lobe of the liver there was a large abscess which had discharged into the intestinal canal by two openings—the first into the duodenum about four inches from the pylorus, the other into the ascending colon nearly the same distance from the caput coli. The small intestine was apparently healthy, but the colon was ulcerated throughout.—Assistant Surgeon J. V. R. Hoff, U. S. A. [Nos. 1149 and 1150, Medical Section, Army Medical Museum, are from this case. No. 1149 consists of a portion of the right lobe of the liver with the right kidney and parts of the ascending colon and duodenum attached. The abscess-cavity in the liver communicates with the colon and duodenum, as described above. The mucous membrane of the cæcum and ascending colon is thickened, and presents follicular ulcers with pseudomembranous frosting between the ulcers. No. 1150 is a portion of the transverse colon presenting similar lesions.]

## SECTION IV.

### REMARKS ON THE PATHOLOGY AND TREATMENT OF DIARRHŒA AND DYSENTERY.

In this section some general remarks will be offered with regard to the symptoms, morbid anatomy, causes and treatment of diarrhœa and dysentery as observed during the war. The manifold varieties of these diseases may conveniently be grouped under the following heads:

1. *Acute Diarrhœa*, including the cases due to inflammation of the intestinal mucous membrane as well as those in which the intestinal lesion does not progress beyond simple irritation.

2. *Acute Dysentery*, including both the simple inflammatory and the diphtheritic forms.

3. *Chronic Dysentery*, under which head the cases reported during the war as chronic diarrhœa will also be included.

4. *Diarrhœa connected with tubercular ulceration of the intestines.*

This classification is based chiefly upon clinical considerations. All cases of flux in which the frequent liquid stools are unaccompanied by marked tenesmus will be included in the first group; when tenesmus is a prominent symptom the cases will be assigned to the second; and the chronic fluxes will be grouped under the third, whether tenesmus be present or not; the fourth group is established for anatomical reasons, and includes those cases of diarrhœa, occurring chiefly among soldiers suffering from phthisis, in which there is tubercular ulceration of the intestines.

The great majority of the fluxes observed during the war belong to the first three groups, and in the acute cases the distinction here made appears to be of some importance; for, whenever tenesmus was a prominent symptom, the disease was more severe and the danger to life greater. The chronic cases, however, whether tenesmus was present or absent, resembled each other in so many respects that it seems most convenient to consider them under a single head.

A more detailed classification, based upon the anatomical lesions observed in autopsies, might appear desirable, but there are many difficulties in the way of such an undertaking. These difficulties will be encountered, whether the nature of the anatomical changes of the mucous membrane, or the portion of the intestine involved, be taken as the ground of distinction; during life it is not always possible to determine the former, and still more frequently it is impossible to fix the latter, so that no such classification would be of as much practical value to the military surgeon as the less ambitious one here adopted.

## 1. Acute Diarrhœa.

Under this designation, as already indicated, it is proposed to include those cases in which the intestinal lesion does not progress beyond a mere condition of irritation expressed by increased and modified secretion, as well as those in which there is actual inflammation of the mucous membrane. No practical good result can be attained by separating these conditions; the latter is only a higher degree of the former, and the one passes into the other by insensible degrees. The extremely mild and extremely severe cases differ considerably; but it is difficult to draw a line between them, even when the opportunity is afforded for an examination of the intestine after death, and quite impossible to connect the clinical phenomena with the grade of the morbid process in any very definite way.

This mode of regarding the subject agrees substantially with the views of Bamberger, Richter, Lebert, Niemeyer, and other modern German writers,* who include, under the head of intestinal catarrh, or catarrhal inflammation of the mucous membrane of the intestines, (*Darmkatarrh, Katarrhalische Darmentzündung, Katarrhalische Entzündung der Darmschleimhaut, Darmschleimhautentzündung, etc.,*) both the hyperæmic and inflammatory conditions of any part, or of the whole of the intestinal mucous membrane.

The lesions, whether mild or severe, are most generally seated in the cæcum and colon; but more or less extensive tracts of the small intestine, especially of the ileum, are often involved also.† This statement, which is in complete accord with the best modern pathological observations made in civil life, is quite at variance with an opinion which prevailed very generally among our medical officers at the commencement of the war, and which I have ascertained by personal inquiries is still entertained by very many American physicians. According to this opinion, the small intestine is the part of the alimentary canal particularly concerned in diarrhœa, the large intestine in dysentery; and while diarrhœa is rather to be looked upon as a symptom of several morbid conditions than as a distinct disease, yet, so far as it depends upon irritation or inflammation of the intestinal canal, it is to be referred to the small intestine. It is true that in dysentery the inflammation often extends into the lower part of the small intestine, and in like manner, in diarrhœa, the inflammation of the small intestine may extend into the large; but should any considerable area of the colon be thus involved, the diarrhœa will assume a dysenteric character or pass into actual dysentery.

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* See H. Bamberger—*Krankheiten des Chylopoëtischen Systems*—in Virchow's *Handbuch der Speciellen Pathologie und Therapie;* Erlangen, 1855, Bd. VI, Abth. I, S. 335. Hermann Eberhard Richter, *Grundriss der inneren Klinik;* 4te auflage, Leipzig, 1860, Bd. II, S, 361. Hermann Lebert, *Handbuch der Praktischen Medicin;* 4te auflage, Tübingen, 1871, Bd. II, S. 383. Felix v. Niemeyer, *Lehrbuch der Speciellen Pathologie und Therapie;* 7te auflage, Berlin, 1868, Bd. I, S. 615. Reinhold Köhler, *Handbuch der Speciellen Therapie;* 3te auflage, Tübingen, 1868, Bd. II, S. 228. Adolf Lazansky, *Compendium der Pathologie und Therapie der localen inneren Krankheiten;* Erlangen, 1868, S. 367. Franz Hartmann. *Compendium der Speciellen Pathologie und Therapie;* 2te auflage, Berlin, 1866, S. 387. C. F. Kunze, *Lehrbuch der Practischen Medicin;* Leipzig, 1870, Bd. I, S. 303. I note S. Jaccoud, *Traité de Pathologie interne,* 2me édit., Paris, 1872, Tome II, p. 303, among the recent French, and F. T. Roberts—*Handbook of the Theory and Practice of Medicine,* Am. edit., Philadelphia, 1874, p. 689—among recent English writers as having adopted the same view.

† See Niemeyer, *op. cit.,* Bd. I, S. 617. Bamberger, *op. cit.,* S. 338. F. J. V. Broussais—*Histoire des Phlegmasies,* 3me édit., Paris, 1822, Tome III, p. 47—went so far as to declare that the small intestine is rarely involved in diarrhœa: "Il est fort rare de trouver dans les cadavres des diarrhéiques des signes de phlogose à cette portion de la muqueuse qui se déploie dans les intestins grêles." P. Vignes—*Traité Complet de la Dysenterie et de la Diarrhée;* Paris, 1825, p. 328—though not so exclusive, also holds that the large intestine is especially the seat of diarrhœa: "Les causes premières qui donnent naissance aux diarrhées sont une *phlegmasie* toujours moins grande que dans la dysenterie, ou simplement *irritation* ou une *atonie du canal intestinal*, particulièrement des gros intestins; mais ces causes peuvent s'étendre aussi dans tout le reste du trajet alimentaire." Consult also F. G. Boisseau, *Nosographie Organique;* Paris, 1828, Tome I, p. 587. J. Bouillaud, *Traité de Nosographie Médicale;* Paris, 1846, Tome III, who writes: "Colite intense ou dysenterie," p. 178; "Colite légère ou diarrhée," p. 184. John Armstrong, *Acute and Chronic Diseases;* Bell's Am. edit., Philadelphia, 1837, p. 303. J. F. H. Albers, *Erläuterungen zu dem Atlasse der Pathologischen Anatomie;* Bonn, 1847–'57, Abth. IV, p. 172, and S. O. Habershon—*Diseases of the Abdomen;* 2d edit., London, 1862, p. 362:—"It arises generally from an irritated condition of the large intestine."—p. 365—"Catarrhal and mucous diarrhœa arise from a slight inflammatory disease closely allied to ordinary coryza, affecting the mucous membrane of the *large* intestine."

This error, which is a purely scholastic one, unsupported by anatomical observations, would appear to have resulted from the confusion which still exists in medical literature as to the proper signification of the word Enteritis, a term unknown to the ancients, which was employed by the nosologists of the eighteenth century to represent a group of symptoms which we now recognize as belonging in fact to peritonitis.*

It is true that Cullen made two species of enteritis, *e. phlegmonodœa* and *e. erythematica*, referring the latter to the mucous membrane of the intestine and the subjacent cellular tissue;† but in his chapter on enteritis in his First Lines of the Practice of Physic, he treats only of the phlegmonic variety, and gives a description of it which is applicable to peritonitis alone.‡ The great influence of his opinions gave permanence to this view, so that local peritonitis was long described under the name of enteritis by British and American writers.§

* Prior to the nosologists such terms as *inflammatio intestinorum*, *inflammation des boyaux*, &c., were used to designate these symptoms. Compare, for example, SENNERTUS, whose description of *inflammatio intestinorum* agrees substantially with the definition of enteritis given by Sauvages, and clearly applies to peritonitis.—DANIEL SENNERT, *Practicæ Medicinæ* Lib. III, Part II, Sect. I, Cap. II; *De Inflammatione Intestinorum*, Opera, Paris, 1641, Tome III, p. 73. BONETUS, in the *Sepulchretum*, records several autopsies in cases of inflammation of the ileum and colon, in which peritonitis plays a conspicuous part.—THEOPHILUS BONET, *Sepulchretum*, Geneva, 1679, Lib. III, Sectio XIV; *De Ventris dolore, Colico, Iliaco*, etc., Obs. VII and XIX. They are associated with cases of colic, ileus, hernia, &c. In the case of *Febris acuta ab intestinorum inflammatione*, given at length in Lib. IV, Sect. I, Obs. XXXIII, there was perforation of the intestine and general peritonitis.—HOFFMANN, in his chapter on *Febris Intestinorum*, includes inflammations of the mesentery as well as of the intestinal peritoneum.—FREDERICK HOFFMANN, *Medicinæ Rationalis Systematicæ* Tom. IV, Pars I, Sec. II, Cap. XII; *De febre intestinorum inflammatoria ex mesenterio*, Opera, Geneva, 1740, Tom. II, p. 170. BOERHAAVE, in his Aphorisms, gives an account of the symptoms produced by inflammation of the intestines, which includes both peritonitis and ileus.—GÉRARD VAN SWIETEN, *Commentaria in Hermanni Boerhaave Aphorismos, de Cognoscendis et Curandis Morbis*, Paris, 1758, Tom. III, p. 159. See also, as illustrating the ideas prevalent about the middle of the last century, MEYSEREY, *La Médecine d'Arrêt*, Paris, 1754, Art. 365–'8; *De l'Inflammation des Intestins*, Tome II, p. 365. MORGAGNI, in his two epistles, *De intestinorum dolore*, describes cases of hernia, ileus, biliary calculi, worms, &c., and, toward the close of epistle 35, discusses inflammation of the intestines in a manner which shows that peritonitis was embraced in his conception of the subject.—JOHN BAPTIST MORGAGNI, *De Sedibus et Causis Morborum per Anatomen indagatis*, Lib. III, Epists. 34 and 35, Ehroduni in Helvetia, 1779, Tom. II, p. 155 *et seq.* Several observations, in which the lesions of chronic peritonitis are described, will also be found in the 38th and 39th epistles; but this great observer did not recognize peritonitis as a distinct affection. SAUVAGES, the first of the nosologists, in his definition of enteritis, lays most stress on symptoms which belong to peritonitis.—FRANCISCO BOISSIER DE SAUVAGES, *Nosologia Methodica*, Amsterdam, 1763, Tom. II, p. 463; also, editio ultima, Amsterdam, 1768, Tom. I, p. 478. In the first edition he made four species of enteritis: e. iliaca, e. colica, e. flatulenta, e. meseoterica; to these, in the later edition, e. enterocelica—(strangulated hernia)—is added. Sauvages gives a separate place to epiploitis or inflammation of the omentum, but does not name peritonitis in his nosology. LINNÆUS (1763) separated proctitis from enteritis, but makes no mention of peritonitis.—CHARLES LINNÆUS, *Genera Morborum*, Hamburg and Gustrow, 1773, p. 13. R. A. VOGEL (1764) gives, besides enteritis, mesenteritis, omentitis, myocoilitis and peritonitis. I have not seen an original copy of Vogel's Nosology, and quote from the *Apparatus ad Nosologiam Methodicam* of Cullen, editio nova, Amsterdam, 1775, p. 95. J. B. M. SAGAR, (1771,) following Sauvages, distinguishes enteritis and epiploitis, but does not mention peritonitis.—*Systema Morborum Symptomaticum*, Vienna, 1776, p. 641.

† WILLIAM CULLEN, *Nosologia Methodica*, 3d edit.; by John Thomson, Edinburgh, 1820, p. 55. Cullen does not appear to have made this distinction in the earlier editions of his Nosology, (1769 and 1772,) for I find in the Amsterdam edition of 1775 the species given as 1. Idiopathicæ; 2. Symptomaticæ.—*Apparatus ad Nosologiam Methodicam, seu Synopsis Nosologiæ Methodicæ*, Amsterdam, 1775, p. 172. In the earliest edition of his *First Lines of the Practice of Physic*, Edinburgh, 1778, Vol. I, p. 308, he subdivided idiopathic enteritis into phlegmonic and erysipelatous. The latter term is, however, replaced by the word erythematic in the edition of 1784, Vol. I, p. 372, and in subsequent editions of both the Nosology and the First Lines.

‡ Consult *First Lines*, edit. of 1778, Vol. I, p. 308, and subsequent editions. Following Vogel, Cullen included peritonitis in his Nosology, but did not describe it in his *First Lines*, "because we cannot say by what symptoms they are always to be known; and farther, because, when known, they do not require any remedies besides those of inflammation in general."—*Op. cit.*, Vol. I, p. 293, and subsequent editions. The vague character of the notions of peritonitis generally prevailing at the time may be illustrated from the remarks of ERASMUS DARWIN in the *Zoonomia*, (1794–'6,) that "it has probably most frequently a rheumatic origin." I quote from the Philadelphia edition of 1797, Part II, Chap. II, Order 1, Gen. 8, p. 250. In this work no definition is offered of either peritonitis or enteritis; indeed, the definitions of very many diseases are omitted because they "may be seen in the Nosologia Methodica of Sauvages, and in the Synopsis Nosologiæ of Dr. Cullen." [See Preface to Part II.] The first distinct mention which I find of inflammation of the peritoneum as an affection independent of inflammation of the subjacent parts is by JOHN HUNTER—*A treatise on the Blood, Inflammation, and Gunshot Wounds*, London, 1794, p. 244—who compares peritonitis to pleurisy, which had long been recognized as a distinct affection. Hunter, in fact, was the first to point out clearly the differences between inflammation of the serous and mucous membranes.—*Op. cit.*, p. 241, &c.

§ Among the British writers who followed Cullen's views of enteritis most closely, I may cite: BARTHOLOMEW PARR, *The London Medical Dictionary*, (1809,) American edit., Philadelphia, 1819, Art. Enteritis, Vol. I, p. 805. THOMAS YOUNG—*An Introduction to Medical Literature, including a System of Practical Nosology*, London, 1813, p. 228—who uses the term *cauma enteritis*, cauma signifying inflammatory fever. JOHN MASON GOOD—*The Study of Medicine, with a Physiological System of Nosology*, (1817,) 4th American edit., Philadelphia, 1825, Vol. II, p. 256, Vol. V, p. 141—who uses the term *empresma enteritis*, the word empresma being employed as the generic term for internal or visceral inflammation; and calls Cullen's e. phlegmonodea, e. adhæsiva. GEORGE GREGORY—*Elements of the Theory and Practice of Physic*, 2d American from the 3d London edit. Philadelphia, 1829, p. 451—who formally defines enteritis as "inflammation of the peritoneal coat of the intestines;" but has a chapter also (p. 457) on "inflammation of the mucous membrane of the alimentary canal," and in a note to the section on "inflammation of the mucous membrane of the small intestines," suggests, "*enteritis mucosa* is perhaps its legitimate denomination." JOHN ABERCROMBIE—*Pathological and Practical Researches on Diseases of the Stomach, the Intestinal Canal, the Liver and other Viscera of the Abdomen*, Edinburgh, 1828, p. 149—who describes peritonitis and inflammation of the mucous membrane of the intestines separately, and limits the term enteritis to those cases in which the inflammation affects "the peritoneal and muscular coats at once." JOHN ELLIOTSON—*The Principles and Practice of Medicine*, 2d edit., London, 1846, p. 1047—whose description of enteritis corresponds strictly with the phlegmonous variety of Cullen. HERBERT MAYO—*Outlines of Human Pathology*, American edit., Philadelphia, 1841, p. 235—who takes the same view of enteritis, describes also inflammation of the intestinal mucous membrane, the acute form of which he tells us is extremely rare: and THOMAS WATSON—*Lectures on the Principles and Practice of Physic*, new American edit., Philadelphia, 1858, p. 886—who, in his lecture on enteritis, describes only the phlegmonous variety of Cullen. Among the American writers I may mention JAMES THACHER, *American Modern Practice*, Boston, 1817, p. 449; also *Ib.*, new edit., Boston, 1826, p. 388; in this edition the author adopts Hosack's Nosology, Preface, p. VII. JOSEPH A. GALLUP—*Outlines*

In France, on the other hand, near the close of the last century, the use of the word enteritis was limited by Pinel, in his *Nosographie Philosophique*, to inflammation of the intestinal mucous membrane, a usage which soon became general among the French writers, and, in consequence of the growing influence of the French school, was extensively adopted in other countries.*

The prevalence of this view had the effect of giving prominence in certain quarters to that dual conception of enteritis which Cullen had propounded in his Nosology, but had failed to establish on a firm foundation. Inflammations of the peritoneal and of the mucous coats of the intestines were described as two varieties of enteritis, and the attempt was thus made to reconcile the observations of the pathological anatomists with the teachings of the nosologists.†

Meanwhile, a limitation of the term yet narrower than that made by Pinel was proposed by Broussais, who, in the *Propositions de Médecine* prefixed to his *Examen des Doctrines Médicales*, restricted enteritis to inflammation of the mucous membrane of the

*of the Institutes of Medicine*, Boston, 1839, Vol. II, p. 95—who defines enteritis as "inflammation of the fibro-muscular coat of the intestines." DAVID HOSACK, *A System of Practical Nosology*, 2d edit., New York, 1821, p. 212; and N. CHAPMAN, *Lectures on the more Important Diseases of the Thoracic and Abdominal Viscera*, Philadelphia, 1844, p. 255. Chapman teaches that enteritis ordinarily involves all the coats, and that "an exclusive mucous phlogosis is exhibited, perhaps, only in mild diarrhœa, and even here it is among the rarest of events."

* PHILIPPE PINEL—*Nosographie Philosophique*, (1798,) 6me édit., Paris, 1818, Tome II, p. 306.— In his first edition Pinel separated inflammations of the mucous from those of the diaphanous membranes, (which in subsequent editions, following Bichat, he called serous,) and placed enteritis among the former, peritonitis among the latter. BROUSSAIS, however, has pointed out—*Examen des Doctrines Médicales*, Paris, 1821, Tome II, p. 475—that, notwithstanding this distinction, in describing enteritis he ascribes to it the symptoms of peritonitis. I note that this error is not fully corrected in the later editions, and that although catarrhal diarrhœa and dysentery are included by Pinel among the phlegmasiæ of the mucous membranes, they are described separately, and not under the head of enteritis. CHOMEL—*Dictionnaire de Médecine*, 2d édit., Tome XXIII, Paris, 1841, p. 559—has claimed the credit of correctly distinguishing between enteritis and peritonitis for Bichat; but even ANTOINE MIQUEL—*Éloge de Xavier Bichat*, Paris, 1823, note 19, p. 72—who so passionately blames Broussais for ascribing the distinction to Hunter, as he correctly does—*Loc. cit.*; also Tome I, p. 298—and who has pointed out the great influence which the *Anatomie Générale* had upon the subsequent edition of the Nosographie Philosophique, is obliged, by the date of the first edition, to give the priority to Pinel rather than to Bichat. Bichat himself tells us that it was the perusal of Pinel's work which suggested his treatise on the membranes, the germ of the Anatomie Générale.—XAVIER BICHAT, *Traité des Membranes*, (1800,) nouv. édit., Paris, 1827, p. 4. A good account of peritonitis, with a brief sketch of intestinal catarrh, will be found in Bichat's *Anatomie Pathologique*, Paris, 1825. It is, however, doubtful how far this work, published more than twenty years after the death of its reputed author, from a manuscript purporting to contain notes of his lectures, really represents his views. [See the introductory notice by Boisseau, prefixed to the work.] Among the continental authors who followed Pinel in using the term enteritis to signify inflammation of the mucous membrane of any portion of the intestinal canal from the pylorus to the anus, I may cite: RENAULDIN, Art. *Entérite*, in the *Dictionnaire des Sciences Médicales*, Tome XII, Paris, 1815, p. 361. DALMAS, Art. *Entérite*, in the *Dictionnaire de Médecine*, 2me édit., Tome XVII, Paris, 1838, p. 33. J. BÉHIER et A. HARDY—*Traité Élémentaire de Pathologie Interne*, 2me édit., Tome II, Paris, 1864, par. I, p. 333—who follow the statement "à proprement parler, le mot entérite désigne particulièrement l'inflammation des intestins grêles" by the remark "nous croyons devoir laisser à l'entérite son acception la plus large;" and RUD. LEUBUSCHER—*Handbuch der Medicinischen Klinik*, Leipzig, 1859, Bd. I, S. 480—who, however, although he uses the term enteritis as the equivalent of inflammation of the mucous membrane of any portion of the intestinal canal, giving a general description of a catarrhal and diphtheritic form, subsequently describes separately: 1, Catarrh and inflammation of the duodenum and the ileum; 2, of the colon; 3, of the cæcum; 4, of the rectum; and 5, dysentery. Among British and American writers I may name: DAVID CRAIGIE—*Elements of the Practice of Physic*, Edinburgh, 1837, Vol. I, p. 893, and Vol. II, (1840,) p. 171—who proposed the term *enteria* to distinguish inflammation of any part of the intestines, and refers the enteritis of Cullen and the nosologists to peritonitis. WILLIAM P. DEWEES—*Practice of Physic*, 2d edit., Philadelphia, 1833, p. 594—who remarks: "By enteritis we are to understand an inflammation of *the internal coat of the intestines*. We have emphasized 'the internal coat of the intestines,' as Good and Gregory, two of the latest British writers on Practical Medicine, seem to have confounded peritonitis with enteritis; a mistake of great pathological and therapeutical consequence." JOHN MACKINTOSH—*Principles of Pathology and Practice of Physic*. 2d American edit., Philadelphia, 1837, Vol. I, p. 344—who says: "Inflammation of the mucous membrane of the bowels, (enteritis,)" &c.

† Consult, for example: C. F. TACHERON—*Recherches Anatomico-Pathologiques sur la Médecine Pratique*, Paris, 1823, Tome II, p. 419—"L'entérite est l'inflammation de la totalité ou seulement d'une partie de la muqueuse intestinale, ou de toute l'épaisseur des intestins grêles ou gros." CHOMEL—Art. *Entérite*, *Nouveau Dictionnaire de Médecine, Chirurgie, etc.*, Tome I, Paris, 1826, p. 678—who divides enteritis into 1, *e. superficielle*, or diarrhœa; 2, *e. profonde ou phlegmoneuse;* and 3, *dysenterie*. The author of the article *Entérite* in the *Dictionnaire des Dictionnaires de Médecine*, Tome III, Paris, 1840, p. 582, who divides it into *e. phlegmoneuse* and *e. muqueuse*, subdividing the latter into *e. villeuse, e. folliculeuse*, and *e. pseudo-membraneuse*. H. BRESSLER—*Die Krankheiten des Magens und Darmkanals*, Berlin, 1841, S. 295—who describes *e. peritonæa muscularis* after Abercrombie, and *e. mucosa* after Scoutetten. Compare also the following British and American authors: JOHN ARMSTRONG—*Lectures on the Morbid Anatomy, Nature, and Treatment of Acute and Chronic Diseases*, Bell's Am. edit., Philadelphia, 1837—who describes muco-enteritis (p. 302) and sero-enteritis, (p. 309,) subdividing the former into muco-enteritis of the small intestines, and of the large, and including diarrhœa and dysentery under the last head. See also IB., *The Morbid Anatomy of the Stomach, Bowels, and Liver*, London, 1838, p. 71: "Inflammation of the serous membrane of the bowels is very frequent in this country, and is, in the majority of examples, unconnected with inflammation of the mucous texture." In this work there are six quarto colored plates to represent the morbid appearances of sero-enteritis; of these, two represent ordinary peritonitis; one, "that peculiar state of bowels called hemorrhagic," "in which all the textures are highly engorged with blood of a remarkably rich dark-purple color;" one is an intussusception of the bowel; one is typhoid ulceration and perforation, with peritonitis; and one tubercles of the peritoneum. MARSHALL HALL—*Principles of the Theory and Practice of Medicine*, London, 1837—who describes sero-enteritis under the head of enteritis: "The morbid anatomy in enteritis consists chiefly in the deposit of layers of lymph upon the intestine, leading to adhesions," p. 378, and proposed to distinguish inflammation of the intestinal mucous membrane as eso-enteritis; acute eso-enteritis he divides into membranous and glandular. JOHN EBERLE—*Practice of Medicine*, 2d edit., Philadelphia, 1831, Vol. I, p. 197—who describes separately peritoneal enteritis and mucous enteritis; and EDWIN R. MAXSON—*A Treatise on the Practice of Medicine*, Philadelphia, 1861—who describes peritoneal enteritis (p. 354) and mucous enteritis, (p. 356:) "By mucous enteritis, I mean here inflammation of the mucous membrane of the small intestines, including the duodenum, jejunum and ileum; and also of the large intestines, if not attended with griping pains in the lower portion of the abdomen, and mucous or bloody evacuations."

small intestine, and bestowed the designation *colite* upon that of the colon.* It is not wonderful that, during the season of almost universal popularity which the doctrines of Broussais enjoyed, this distinction should have been generally adopted; but it has survived the fall of Broussaisism, and continues to find favor in many quarters at the present day.

Some of those who adopted this limitation of enteritis also divided it into a peritoneal and a mucous variety,† while others, who continued to use the term as Pinel did, for

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* F. J. V. BROUSSAIS—*Examen des Doctrines Médicales et des Systèmes de Nosologie*, Paris, 1821, Tome I; also *Commentaires des Propositions de Pathologie*, Paris, 1829, Tome I, pp. 201 and 212: "*Prop. CXXVI. L'inflammation de la membrane muqueuse des intestins grêles s'appelle entérite.*" "*Prop. CXXXV. Le mot entérite étant consacré à l'inflammation de l'intestin grêle, ne peut servir à distinguer celle du colon; il faut appeler celle-ci colite.*" The combination of gastritis with enteritis Broussais called *gastro-entérite*—Props. 130 and 131—and supposed it to constitute the real lesion in both continued and intermittent fevers.—Props. 139 and 222. In his earlier writings Broussais used the term, as Pinel did, for inflammation of the large intestine also: "La phlogose de la muqueuse du colon, que j'appellerai entérite," &c.—*Histoire des Phlegmasies*, 2d édit., Paris, 1816, Tome II, p. 218. In the 3d edition (Tome III, Paris, 1822, p. 49) the author adds the following note to this passage: "Le nom de *colite* lui convient mieux; il est même indispensable pour la distinguer de l'inflammation des intestins grêles. (*Voyez l'Examen des Doctrines.*) L'entérite, d'ailleurs se complique souvent avec la colite." S. O. HABERSHON—*Diseases of the Abdomen*, 2d edit., London, 1862, p. 268—has singularly perverted the meaning of this passage: "There has been considerable confusion in the application of the term enteritis; Broussais considered it to be inflammation of the colon," &c. Before Broussais, C. A. PERROTEAU—*Dissertation sur l'Entérite Chronique, ou Inflammation lente des Intestins grêles*, Paris, 1801, p. 1, (Paris Theses No. 30)—had described chronic inflammation of the small intestine under the designation of chronic enteritis: "J'entends par entérite ileaque lente, ou simplement entérite lente, entérite chronique, une phlegmasie de l'iléon ou du jéjunum," &c. I do not, however, understand him to propose to limit the use of the word enteritis to the variety which he described. The influence of Broussais' ideas on this subject may be observed in several of the Paris Theses as early as 1818. As for example: M. G. GRESET—*Dissertation sur l'Entérite Chronique ou Inflammation lente des Intestins grêles*, Paris Theses No. 53, 1818, p. 7: "L'entérite est l'inflammation de la membrane muqueuse des intestins. Il en est de plusieurs sortes: 1. l'entérite proprement dite, mot assigné à l'inflammation des portions supérieures du tube intestinal; 2. la diarrhée et la dysenterie, qui sont dues à l'inflammation des portions inférieures," &c. This thesis is dedicated to Broussais, who was then, and had been for several years, professor in l'Hôpital Militaire d'Instruction. Consult also F. J. BOULLARD, *Dissertation sur les Inflammations de la Membrane Muqueuse de l'Estomac et des Intestins grêles*, Paris Theses No. 110, 1818; and J. J. A. LE BATTEUX, *Essai sur l'Inflammation aiguë de l'Intestin grêle*, Paris Theses No. 176, 1820. I note among those who followed Broussais in dividing the phlegmasiæ of the alimentary canal below the diaphragm into gastrite, entérite and colite, with their association together, especially as gastro-entérite and entéro-colite, the following French authors: M. L. ROSTAN, *Traité Élementaire de Diagnostic, &c.*, Paris, 1826, Tome II, p. 489. F. G. BOISSEAU, *Nosographie Organique*, Paris, 1828, Tome I, p. 514. L. CH. ROCHE, Art. *Entérite* in the *Dictionnaire de Médecine et de Chirurgie Pratiques*, Paris, 1831, Tome VII, p. 291: "Ce nom s'applique presque exclusivement à l'inflammation de la membrane muqueuse des intestins grêles." See also L. CH. ROCHE, L. J. SANSON *et* A. LENOIR—*Nouveaux Élèments de Pathologie Medico-Chirurgicale*, (1828,) 4me édit., Paris, 1844, Tome I, p. 466. G. ANDRAL—*Cours de Pathologie Interne*, Paris, 1836, Tome I—who describes gastro-entérite, p. 7, and entéro-colite, p. 72; the latter term, however, is used as the equivalent of l'entérite chronique. *Bibliothèque du Médecin Praticien*; Par une Société de Médecins, sous la direction du DR. FABRE, Paris, 1849, Tome XI, p. 492, Art. Inflammation des Intestins: "Nous diviserons l'entérite en aiguë et en chronique réunissant sous le même titre les inflammations des diverses parties de l'intestin grêle." F. L. I. VALLEIX, *Guide du Médecin Praticien*, 5me édit., Paris, 1866, Tome IV, p. 20. This author, however, inclines to a somewhat more liberal view: "Pour nous *l'entérite* est l'inflammation de l'intestin grêle qui s'étend ou non au gros intestin." A. GRISOLLE—*Traité de Pathologie Interne*, 9me édit., Paris, 1869, Tome I, p. 305: "Le mot entérite semblerait devoir exprimer toute inflammation siégeant sur un point quelconque de la membrane muqueuse du tube intestinal; mais l'usage l'a surtout consacré pour désigner la phlegmasie de l'intestin grêle, et surtout celle qui occupe le jéjunum et l'iléon." Among the German authors who adopted a similar limitation I may mention: CARL GEORG NEUMANN—*Von den Krankheiten des Menschen*, Berlin, 1836–'44—who, though he does not formally use the word enteritis, describes separately "Entzündung der dünnen Därme," Bd. I, S. 237, and Entzündung der Dickdärme, Bd. I, S. 271. CONRAD HEINRICH FUCHS—*Lehrbuch der Speciellen Nosologie und Therapie*, Güttingee, 1846, Bd. II, Abth. I, S. 425—who uses enteritis as the equivalent of *Dünndarmentzündung*. C. A. WUNDERLICH—*Handbuch der Pathologie und Therapie*, Stuttgart, 2te auflage, 1856, Bd. III, S. 178 *et seq.*—who describes separately inflammations of the small intestine, cæcum, colon and rectum, and only uses the term enteritis in connection with the small intestine. CARL KISSEL—*Denkwürdigkeiten aus der Ärztlichen Praxis*, Berlin, 1872, S. 604—who enumerates enteritis, perityphlitis, typhlitis, colitis and proctitis. I note also the following American and British authors as adhering to Broussais' limitation of enteritis: GEORGE B. WOOD—*Practice of Medicine*, 6th edit., Philadelphia, 1866, Vol. I, p. 703: "Enteritis, then, as employed in this work, signifies inflammation of the mucous membrane of the jejunum and ileum, extending frequently to a greater or less distance into the colon, and occasionally involving the other coats as a secondary result. The force of the disease is usually spent upon the ileum; the jejunum being less liable to inflammation than any other portion of the alimentary canal." "As the inflammation may extend indefinitely into the colon, it is obvious that the phenomena of dysentery must often be mingled with those of the complaint under consideration." WILLIAM AITKEN—*The Science and Practice of Medicine*, 3d American edit., Philadelphia, 1872, Vol. II, p. 628: "Enteritis. Definition: Inflammation of the small intestines." "Although enteritis is generally described in text books, as a rule it is a rare disease, and seldom affects the intestine throughout its whole extent." AUSTIN FLINT—*Principles and Practice of Medicine*, 4th edit., Philadelphia, 1873, p. 383: "Inflammation of the mucous membrane of the small intestines is designated enteritis."

† Thus, for example, JAMES COPLAND—*Dictionary of Practical Medicine*, Vol. II, London, 1844, article *Intestine*, p. 568—describes separately, 1, Inflammation of the small intestines—enteritis; 2, Inflammation of the large intestines—colitis; 3, Inflammation of both small and large intestines—ileo-colitis. Enteritis he divides into inflammation of the mucous surface—muco-enteritis; inflammation of the glands—glandular enteritis, (the lesion of typhoid fever;) and inflammation of all of the coats, the enteritis phlegmonodœa of Cullen. J. L. SCHÖNLEIN—*Allgemeine und Specielle Pathologie und Therapie*, 6te auflage, St. Gallen, 1846, Theil. I, S. 226—describes "*Entzündung des Dünndarms.* Enteritis." "Erste Art. e. serosa." "Zweite Art. e. mucosa." S. O. HABERSHON—*Diseases of the Abdomen*, 2d edit., London, 1862, p. 268—also uses the term only for inflammation of the small intestine, and remarks: "Enteritis, then, manifests itself under two forms: 1, That involving only the mucous membrane, and which has a disposition to extend in the course of the mucous membrane—muco-enteritis; and, 2, That in which the disease extends in depth, rather than on the surface, and implicates the muscular, peritoneal coats, and the connecting tissues: both commence in the mucous membrane." To these I may add J. M. DA COSTA—*Medical Diagnosis*, 3d edit., Philadelphia, 1870, p. 472—who remarks: "Enteritis means now, by common consent, inflammation of the small intestine, and especially of the portion that lies between the duodenum and the colon. The morbid process may extend to the colon; if, however, it involve a large portion of the latter, it is colitis or dysentery, and not enteritis with which we have to deal. There are two forms of enteritis: one in which the mucous membrane of the bowel is alone affected; the muco-enteritis, or the catarrhal inflammation of recent authors, the erythematous enteritis of Cullen. In the second, more than the mucous tunic is implicated; there is also inflammation of the submucous and muscular coats, or even of the serous investment of the bowels. To this variety of the complaint the term enteritis is by several writers restricted; and it is to this form of the malady, occurring acutely, that the description about to be given more particularly applies;" and JOHN SYER BRISTOWE—Art. *Enteritis*, in *Reynald's System of Medicine*, Vol. III, London, 1871, p. 56—who subdivides the disease as follows: I. As affecting the serous and muscular coats. II. As affecting the mucous membrane: a. catarrhal inflammation; b. croupous inflammation; c. chronic inflammation and degeneration. III. As affecting the whole thickness of the bowel.

inflammation of the mucous membrane of all portions of the intestines, have nevertheless attempted to discriminate varieties corresponding to the several portions of the intestinal canal—duodenitis, jejunitis, ileitis, typhlitis, colitis and proctitis—and exercised themselves in the attempt to find symptoms which might enable the practitioner to diagnosticate during life the portion of the intestine affected.*

The confusion which has resulted from these diverse conceptions of enteritis has been still further increased by the circumstance, which will be referred to more fully in a subsequent chapter, that cases characterized by the lesion of the agminated glands of the small intestine peculiar to typhoid fever were universally included under the head of enteritis at the beginning of the present century, and continued to appear in many systematic treatises as a variety of enteritis (*entérite folliculeuse*, glandular enteritis, &c.) long after the relation of this lesion to a particular febrile disease was fully established.† Moreover, it has unfortunately happened that a number of the authors who followed Broussais in defining enteritis as limited to the mucous membrane of the small intestine, continued to ascribe to it the symptoms which had been detailed by those who used the term in its broader signification, and the misconceptions thus countenanced have been the more mischievous, because in many modern English and American treatises the question of the real nature of the intestinal lesion in acute diarrhœa is either very imperfectly discussed or altogether neglected; and because the disease so rarely terminates fatally in civil life that the opportunities afforded for post mortem examinations are comparatively infrequent.‡ Perhaps it is on account of the latter circumstance chiefly, that some systematic writers have gone so far as to propose to strike diarrhœa from the list of diseases, regarding it as a mere symptom of a number of pathological conditions,§ among which it is true they include irritation

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*For example: WILLIAM STOKES—Article *Enteritis, Cyclopædia of Practical Medicine*, American edit., Philadelphia, 1845, Vol. II, p. 46—includes, under enteritis, duodenitis, inflammation of the jejunum and ileum, inflammation of the cæcum, inflammation of the appendix vermiformis, and colitis. Substantially the same views are expressed in his *Lectures on the Theory and Practice of Physic*, 1st American edit., Philadelphia, 1837, p. 59. So also ROBLEY DUNGLISON—*The Practice of Medicine*, Philadelphia, 1842, Vol. I, p. 102—divides enteritis into 1, Inflammation of the small intestines; 2, Inflammation of the large intestines. The first he subdivides into—a, inflammation of the peritoneal coat; b, inflammation of the mucous coat; c, exanthematous inflammation of the mucous coat; the second into—a, inflammation of the cæcum; b, of the appendix vermiformis cæci; c, of the colon, (1, of the peritoneal coat of the colon; 2, of the mucous coat.) Compare also ERNST A. L. HÜBENER—*Specielle Pathologie und Therapie*, Erlangen, 1850, Bd. I, S. 407—"Enteritis ist der Collectivnaeme für sämmtliche Darmentzündungen." "Je nachdem dieses oder jenes Gewebe des Darms afficirt ist, theilte man die Enteritis in eine muscularis, mucosa und serosa, letztere wieder in eine villosa und follicularis." He describes—1, Duodenitis; 2, Ileitis; 3, Typhlitis; 4, Colitis; 5, Proctitis; and SAMUEL HENRY DICKSON—*Elements of Medicine*, Philadelphia, 1855, p. 470—who also includes duodenitis, ileitis, typhlitis and colonitis under the head of enteritis, but defines the disease as limited to the mucous membrane.

†See, for example: GREGORY, work cited on page 267, Vol. I, p. 463. CHAPMAN, work cited on page 268, p. 260. CRAIGIE, work cited on page 268, Vol. I, p. 899. TACHERON, work cited on page 268, Tome II, p. 495. A. N. GENDRIN, *Histoire Anatomique des Inflammations*, Paris, 1826, Tome I, p. 587: "Phlegmasies pustuleuses des membranes muqueuses et des membranes villeuses." C. A. PERROTEAU, *Diss. sur l'Entérite Chronique*, Paris, 1801. C. P. FORGET, *Traité de l'Entérite Folliculeuse, (fièvre typhoïde,)* Paris, 1841. J. BOUILLAUD, *Traité de Nosographie Médicale*, Paris, 1846, Tome III, p. 92. F. G. BOISSEAU, *Nosographie Organique*, Paris, 1828, Tome I, p. 518. L. CH. ROCHE, Art. *Entérite, Dict. de Méd. et de Chir. Pratiques*, Paris, 1831, Tome VII, p. 299: "Entérite folliculeuse." JAMES COPLAND, *Dictionary of Practical Medicine*, London, 1844, Vol. II, p. 571: "Glandular Enteritis." W. STOKES, Art. *Enteritis, Cyclopædia of Practical Medicine*, Philadelphia, 1845, Vol. II, p. 53. SCOUTETTEN, "Des follicules de la membrane muqueuse du tube digestif sous le rapport anatomique, physiologique et pathologique," in *Jour. Comp. du Dict. des Sciences Médicales*, Tome 29, Paris, 1827, p. 200: "Ainsi désormais l'inflammation de la membrane muqueuse de l'estomac et de l'intestin ne sera plus divisée qu'en gastro-entérite folliculeuse, et gastro-entérite villeuse." M. L. ROSTAN, *Traite Élémentaire de Diagnostic*, etc., Paris, 1826, Tome II, p. 497: "Entérite avec éruption furonculeuse ou dothienentérite." DALMAS, Art. *Enterite, Dictionnaire de Médecine*, 2me édit., Paris, 1838, Tome 17, p. 40: "Entérite typhoïde." MARSHALL HALL, *Principles of the Theory and Practice of Medicine*, London, 1837, p. 385: "Glandular eso-enteritis."

‡Thus, for example: Dr. J. F. H. ALBERS—*Erläuterungen zu dem Atlasse der Pathologischen Anatomie*, Bonn, 1847-'57, Abth. IV, S. 171—tells us, in writing of catarrhal inflammation of the intestines: "Es ist mir in einer 25jährigen Praxis keine Leichenöffnung eines an dieser Krankheit Verstorbenen vorgekommen. Dieses in unsern Gegenden so gewöhnliche Leiden wurde regelmässig geheilt."

§This notion appears to have originated with Cullen: "It is with difficulty that I have employed this genus, as it is not very consistent with our plan to let it stand in our nosology. Diarrhœa is universally symptomatic of a great variety of diseases, many of which are different from one another; so that a genus formed from all these is a very complicated one, and comprehends many dissimilar affections and diseases, and there is no use in uniting these under the title of a genus."—The Works of WILLIAM CULLEN, edited by John Thomson, Edinburgh and London, 1827, Vol. II, p. 479. This passage, which forms the first paragraph of the chapter "Of diarrhœa or looseness," in Thomson's edition of Cullen's *First Lines*, does not exist in the editions of that work published during the author's lifetime, but was introduced by Dr. Thomson, with many other passages, from Cullen's manuscript lectures.—See Preface to Vol. I, *op. cit.* Consult, also, the *Dictionnaire des Dictionnaires de Médecine*, Tome III, Paris, 1840, p. 301: "La diarrhée est un symptôme plutôt qu'une maladie proprement dite." WOOD, work cited on page 269, Vol. I, p. 731: "The affection is rather a consequence of certain pathological conditions, than itself a disease." AITKEN, work cited on page 269, Vol. II, p. 675: "This affection is rather a consequence or a symptom of certain pathological states than of itself a disease, and, therefore, it is difficult to give it its true place in nosology."

and inflammation of the intestinal mucous membrane, or of some part of it, but by no means regard these lesions as invariably or even generally present. I cannot assent to this view of the matter, and must regard the diarrhœa which so often occurs in the course of other disorders not as a mere symptom of the primary affection, but as a secondary disease or complication, quite comparable to other intercurrent irritations and inflammations; holding it to depend immediately upon the development of the very same conditions of the intestinal canal as produce it when it exists alone. This subject will be again referred to in connection with tubercular ulceration of the intestines and the diarrhœa of typhoid fever.

DISTINCTION BETWEEN DIARRHŒA AND DYSENTERY.—According to the conception of acute diarrhœa presented above, it is to be distinguished from the milder form of acute dysentery by the absence of tenesmus. The diverse definitions in the books show that various grounds for this distinction have been proposed. These have been both anatomical and clinical: the part of the intestinal canal involved, and the presence or absence of ulceration, belong to the first category; the presence or absence of fever or of contagion, the character of the stools, and the presence or absence of tenesmus, to the latter.*

It would seem, however, that as anatomical considerations are not available during life for the purposes of diagnosis, except so far as clinical phenomena can be shown to correspond to definite lesions, we should give preference to the clinical mode of treating the question. Cullen† distinguished diarrhœa by the fact that it was not contagious and not accompanied by primary fever. At the present day, however, I suppose no one would be willing to affirm either that dysentery is always contagious, or that every case in which there are frequent liquid stools accompanied by fever from the first should be called dysentery; nor does the presence of blood, pus or mucus in the stools seem sufficient to

* From the numerous definitions of the books, I select a few only as samples: SENNERTUS founded his definition partly upon the character of the stools, partly upon the absence of ulceration: "Etsi in genere omne alvi profluvium Diarrhœæ nomine appellari possit; tamen proprie et in specie Diarrhœa is alvi fluxus est, quem immoderata humoris alicujus, præter alimentum crudum et sanguinem, sine exulceratione intestinorum per alvum excretio excitat." SENNERT, *Pract. Med.*, Lib. III, Part. II, Sect. II, Cap. VI, *De Diarrhœa*, Opera, Paris, 1641, Tom. III, p. 115. I note that a recent writer would go even farther than Sennertus, and exclude from the category of diarrhœa all cases in which there was even inflammation of the intestines: "It would seem much better to apply the term diarrhœa to all examples of simple purging; that is to say, to those cases in which the alvine evacuations are frequent, and loose or liquid, without any coexistent inflammation of the intestines."—THOMAS HAWKES TANNER, *The Practice of Medicine*, 5th American, from the 6th London edit., Philadelphia, 1870, p. 665. SAUVAGES based his definition partly upon the character of the stools, partly upon the absence of tenesmus: "Recrementorum et excrementorum utpluriumùm fluxiliorum frequens per anum dejectio morbosa, id est, constans et notabilis. Differt à cœliacâ et lienteria ex eo quod non excernantur ciharia, aut cruda, aut in chylum mutata, ut in quibusdam lienteriæ et cœliacæ speciebus, sed excrementitiæ, aut recrementitiæ materies. A tenesmo, quod nisus ad egerendum non sint ianes. Ab hepatirrhœâ et dysenteriâ, quod ejecta non sint cruenta &. A melœnâ, quod non sint nigra."—*Nosologia Methodica*, 1763, Tom. III, Pars II, p. 133; *Ib.*, 1768, Tom. II, p. 355. Sauvages and Sennertus distinguished diarrhœa not only from dysentery and the hepatic flux, but from the cœliac flux and lientery. CULLEN, on the other hand, like most modern writers, included the hepatic flux, the cœliac flux, and lientery as species of diarrhœa, and founded his definition upon the absence of contagion and of primary fever: "Dejectio frequens; morbus non contagiosus; pyrexia nulla primaria."—*Apparatus ad Nosologiam Methodicam*, Amsterdam, 1775, p. 216. I may mention HABERSHON, as a comparatively recent author, who has adopted the definition of CULLEN.—*Diseases of the Abdomen*, 2d edit., London, 1862, p. 362. JOHN MASON GOOD'S definition approximates that adopted in the text: "Alvine evacuations crude, loose and too frequent: with little or no griping or tenesmus."—*The Study of Medicine*, Philadelphia, 1823, Vol. V, p. 36. COPELAND'S definition is substantially the same: "Frequent, loose or fluid alvine evacuations without tormina or tenesmus."—*Dict. of Pract. Med.*, London, 1858, Vol. I, p. 592. AITKEN adopts Copeland's very words: "A frequent discharge of loose or fluid alvine evacuations without tormina or tenesmus."—*Science and Practice of Med.*, 3d American, from the 6th London edit., Philadelphia, 1872, Vol. II, p. 675. In view of the frequency of acute griping pains (tormina) in inflammatory cases of acute diarrhœa, I cannot think it advisable to make the absence of this symptom a part of the definition. To the foregoing definitions a few others may be added: "Excrétion alvine, fréquente, copieuse et fluide."—RENAULDIN, Art. *Diarrhée, Dictionnaire des Sciences Médicales*, Paris, 1814, Tome IX, p. 231. "Lorsque les déjections alvines ne sont pas sanguinolentes, c'est une diarrhée. Lorsqu'au contraire les déjections sont sanguinolentes, accompagnées de tranchées et de ténesme, il y a dyssenterie."—TACHERON, work cited on page 258, Tome II, p. 420. "Lorsque les excrétions alvines sont plus fréquentes que de coutume, la matière de ces excrétions plus liquide et plus abondante, qu'il s'y joigne ou non de la fièvre ou des coliques, on dit qu'il y a diarrhée."—DALMAS, Art. *Diarrhée, Dictionnaire de Médecine*, 2d edit., Tome X, Paris, 1835, p. 269. "By diarrhœa is meant frequent liquid, and rather copious, feculent stools; not dependent upon debility of the sphincter ani. In dysentery the stools are not feculent. When a person is weak in the sphincter ani, he may have stools every ten minutes; but he would not, on that account, labor under diarrhœa." JOHN ELLIOTSON, *Principles and Practice of Medicine*, 2d edit., London, 1846, p. 1062. "Lorsque les excrétions alvines sont tout à la fois plus liquides, plus fréquentes et plus abondantes qu'elles ne doivent l'être normalement, que ces matières soient constituées par le résidu des aliments non digérés, ou incomplétement digérés, par le produit des sécrétions intestinales, pancréatique, hépatique, qu'elles renferment ou non du sang ou des débris de membrane muqueuse, on dit qu'il y a diarrhée."—A. TROUSSEAU, *Clinique Médicale de l'Hôtel-Dieu de Paris*, 2me édit., Paris, 1865, Tome III, p. 97. "Those cases are denominated diarrhœa in which the alvine evacuations are more liquid, frequent and copious than in health, without being hemorrhagic or dysenteric in their character."—GEORGE B. WOOD, *Treatise on the Practice of Medicine*, 6th edit., Philadelphia, 1866, Vol. I, p. 731.

† *Loc. cit.*

characterize a case as dysentery if tenesmus be absent. The first may result from hemorrhoids, from tubercular ulceration of the bowels, and several other conditions quite distinct from dysentery; the second from hepatic or other abscesses opening into the intestines; and if the presence of an excess of mucus in the stools be regarded as characteristic of dysentery, we should have to include all the cases usually described under the head of catarrhal or inflammatory diarrhœa. On the whole, therefore, the presence or absence of tenesmus would appear to afford the most convenient means of diagnosis for the acute cases at least; the discrimination of the chronic cases is more difficult, as will be seen hereafter.

Symptoms.—Acute diarrhœa very often occurred as a simple looseness of the bowels, the frequent liquid stools being unaccompanied by noteworthy pain or constitutional disturbance. Slight attacks of this character usually lasted but a few days, and terminated in recovery without requiring medical interference. In other mild cases the painless flux was accompanied by dyspeptic symptoms, such as gastric uneasiness, flatulence and diminished appetite. In severer cases griping pains in the abdomen preceded each stool, and generally received temporary relief from the evacuations; more or less nausea and a feeling of faintness were frequently associated with the pains; occasionally there was vomiting. Still severer cases were accompanied by fever, which generally came on gradually after the diarrhœa was fairly under way, but sometimes began abruptly with a chill at the same time as the flux, or even before the first loose stool. Except when these febrile symptoms expressed the commencement of a malarial or typhoid fever, they usually subsided in the course of a few days, leaving behind a simple looseness which might or might not prove troublesome. Tenderness on pressure upon the abdomen was a common phenomenon in the more severe cases; it varied in degree from the slightest uneasiness to the exquisite sensibility of peritonitis. The cases of diarrhœa in which this symptom coexisted with violent colicky pains and fever were frequently returned on the monthly sick reports under the head of inflammation of the bowels, (enteritis, in the form of reports used at the commencement of the war.) In a sketch of my first impressions with regard to the camp diseases of our army, published in 1863, I adopted the same distinction;* I am now satisfied, however, that it answers no useful purpose, and that the term enteritis, as at present employed in many quarters, serves to divert attention from the extent to which the cæcum and colon are usually involved. It seems preferable, therefore, to describe such cases simply as severe cases of acute diarrhœa, except when the degree of tenderness present indicates the existence of local peritonitis, when they should be spoken of as acute diarrhœa complicated with peritonitis. It will be seen, in a subsequent part of this section, that local peritonitis is a still more frequent complication of dysentery, especially of chronic dysentery, and of tubercular ulceration of the bowels. In the chronic cases particularly, the peritonitis sometimes becomes general, glueing all the viscera into a solid mass without arresting the flux, as is shown by several of the cases recorded in the last section. When peritonitis becomes general in acute cases, however, the bowels usually become constipated, as is the case when general acute peritonitis is the primary disease.

*The stools* in acute diarrhœa vary in consistency from a soft pasty mass to a watery fluid. At first they are usually feculent, and in mild cases they retain this character

* J. J. Woodward, *Outlines of the Chief Camp Diseases of the United States Armies*, Philadelphia, 1863, p. 218. In my account of the morbid anatomy of acute enteritis, in this work, I fell into the error of supposing the inflammation to affect the small intestine chiefly, though I was obliged to admit that the "colon may be more or less implicated."

throughout, owing their consistency, in part, to a more or less abundant transudation of serum and secretion of modified mucus from the irritated or inflamed mucous membrane, which becomes intermixed with the fæcal mass; in part to a diminution in the absorption of the more fluid portions of the intestinal contents, which normally takes place during their passage through the intestinal canal. In the severer cases the transudation of serum is sometimes so copious that the stools are correctly described as watery; or the secretion of modified mucus may be so abundant that it can be detected by the naked eye as a glairy admixture. Still further modifications in the character of the stools are produced by changes in the quantity of biliary coloring matter contained in the stools, its deficiency rendering them pale or clay colored, while its increase makes them yellow, greenish or tar-like. The predominance of one or another of these ingredients gives the character to the stools in each individual case, and the variations resulting have served, in part at least, as the basis of the subdivision of diarrhœa into varieties in which systematic writers formerly indulged so liberally.*

* Besides the character of the stools, the presence or absence of fever, the causes determining the flux, or the conditions with which it is associated, have served as an excuse for distinguishing varieties, which, hence, became very numerous in the writings of the Arabian physicians, their disciples, and certain subsequent European physicians, especially the Nosologists. The Greek and Roman physicians made use of a comparatively simple classification. In the Hippocratic writings all the various forms of alvine flux are included under the designations diarrhœa, lientery, dysentery and tenesmus. The term diarrhœa (*διάῤῥοια*) is nowhere formally defined, but is frequently used, and always in the modern sense, except that those chronic fluxes (whether commencing as diarrhœa or dysentery) in which undigested food is recognised in the stools are spoken of as lientery. Variations in the characters of the stools were expressed by the use of adjectives. Thus, HIPPOCRATES speaks of bilious and watery diarrhœas (*διάῤῥοιαι χολώδεες καὶ ὑδατώδεες*) as occurring during the Summer and Autumn in the island of Thasus—*Epidem.* Lib. I, Sect. 2, [Ed. Littré, T. II, p. 617.] So also diarrhœa of long continuance was designated by appending an adjective, HIPPOCRATES speaks of long-lasting diarrhœa (*διάῤῥοια μακρή*—*Aphorisms* VI, 15) [Ed. Littré, T. IV, p. 567]—and *διάῤῥοια πολυχρόνιος*—*Prognostics*, § 8 [Ed. Littré, T. II, p. 134]—which is the equivalent of our modern barbarous) term chronic diarrhœa. In the spurious treatise *On affections*, § 25 and 27, [Ed. Littré, T. VI, pp. 237–8.] there is a summary account of diarrhœa, especially of the chronic form, and an explanation of the mode in which it may be generated by a flux of phlegm from the head and chest to the belly. This doctrine will be again referred to in the notes to the part of this section which refers to dysentery. The ancient opinions with regard to dysentery, tenesmus and lientery will also be discussed in subsequent notes. The Greek writers who followed HIPPOCRATES continued to use these terms in the sense in which they occur in the Hippocratic writings, except that they separated also the cœliac affection as well as lientery from the chronic fluxes. (See a note on the subject of the cœliac affection in the part of this section which treats of chronic dysentery.) I note in the treatise *Definitiones Medicæ* (which has been attributed to GALEN, but without sufficient evidence) the following definition: "Diarrhœa copiosior fluxio est alvi diuturna sine phlegmone et ulceratione," which I should have included in the note to page 271 *supra*—*Opera Galeni*, Ed. Kühn, T. XIX, p. 421. For the views of the Greek physicians on the subject of diarrhœa consult especially, besides the numerous allusions scattered through the writings of HIPPOCRATES and GALEN, the summary, drawn chiefly from PHILUMENUS and GALEN, in the compilation of ÆTIUS—Tetrab. III, Cap. 35 and 36—and the chapter *περὶ ῥευματισμοῦ τῆς γαστρός* in the writings of ALEXANDER of TRALLES—Lib. VIII, Cap. 7. (This chapter, professedly borrowed from PHILUMENUS, is almost identical with Cap. 35, Tetrab. III of ÆTIUS, which is derived from the same source.) CELSUS used the designation *Fluor ventris* as a generic term, including lientery, (lævitas intestinorum,) dysentery, (tormina,) and tenesmus as well as diarrhœa.—Lib. IV, Cap. 16, [Lee's ed., London, 1831, Vol. I, p. 299.] The term *alvi fluxus*, so much used in the same sense by subsequent Latin writers, does not occur in his works. He uses, however, the expression *fluens alvus* to indicate diarrhœa—Lib. II, Cap. 6, [*op. cit.*, p. 69;] so also he says: "*Alvus si vehementius fluit*, hominem infirmat"—Lib. II, Cap. 12 [*op. cit.*, p. 108]—in speaking of hypercatharsis. Among the other expressions used in the writings of CELSUS to indicate diarrhœa, I note *cita alvus*—Lib. I, Cap. 6 [ed. cited, Vol. I, p. 45] and Lib. II, Cap. 8, [*op. cit.*, Vol. I, p. 88.] and *dejectio*—Lib. IV, Cap. 19, [*op. cit.*, p. 302.] This latter term he uses also to express the action of purgative medicines—Lib. II, Cap. 12, [*op. cit.*, p. 108.] The Arabian physicians treated of diarrhœa and the various other fluxes at great length, and while borrowing after their fashion from the Greeks, especially from GALEN, showed their usual tendency to elaborate classification and the multiplication of subdivisions. Thus, in the *Canon* of AVICENNA—Lib. III, Fen. 16, Tract. 1 and 2 [Juntas ed., Venice, 1595, T. I, p. 809 *et seq.*]—the various forms of flux are classified in accordance with their supposed causes. Either they result from dietetic errors, or from some lesion of the head, the liver, the spleen, the mesentery, the stomach, the intestines, or of the whole body. After a detailed discussion of the varieties of flux resulting from these causes, separate chapters are given [in Tract. 2] on the treatment of lientery, [flux from the stomach, either with or without ulceration, Cap. 2 and 3,] the hepatic flux, [Cap. 1,] cholera morbus, [Cap. 4.] the splenetic flux, [from black bile, fluxus melancholicus, Cap. 5,] flux of blood without ulceration of the intestines, [Cap. 6: see a subsequent note with regard to the opinions of the Greek physicians on this subject,] flux from excoriation or ulceration of the intestines, [Cap. 7, ulcerative dysentery,] tenesmus, [Cap. 16,] and of seven varieties of simple diarrhœa, viz: (a) diarrhœa from errors of diet, [fluxus ventris factus propter cibos, Cap. 8.] (b) catarrhal or mucous diarrhœa, [fluxus ex capite, fluxus cerebralis, Cap. 9,] (c) diarrhœa from obstruction of the liver, [fluxus oppilativus, Cap. 10,] (d) colliquative diarrhœa, as in hectic and phthisis, [Cap. 11,] (e) diarrhœa from suppressed perspiration, [fluxus factus a spissitudine cutis, Cap. 12.] (f) diarrhœa from the use of purgatives, [fluxus medicinalis, Cap. 14.] and (g) critical diarrhœa, [fluxus creticus, Cap. 15.] The European disciples of the Arabian physicians imitated this elaborate classification. Thus, in the *Lilium Medicinæ* of BERNARD de GORDON, besides chapters on lientery, dysentery, tenesmus and the hepatic flux, [Partic. V, Cap. 13, 14 and 15, and Partic. VI, Cap. 4, Venice ed. of 1496, fol. 159 *et seq.*,] we find separate headings for fluxus ventris propter catarrhum or fluxus cerebralis; fluxus ventris propter oppilationes epatis; fluxus splenecticus; fluxus ex colirica passione; fluxus liquefactivus; fluxus propter pororum clausionem; fluxus propter pororum cutis apertionem; fluxus propter medicinas laxativas; diarria (diarrhœa, that is, as he explains, a simple humoral flux;) fluxus ventris propter cibaria; fluxus ventris propter aerem; fluxus ventris in balbutientibus et traulis, [stammerers and lispers.] fluxus ventris propter dispositiones naturales; and fluxus ventris propter totum corpus. [See the latter part of Cap. 14 and 16, Partic. V.] These subdivisions reappear with but few modifications in the writings of SENNERTUS, who, besides separate chapters on dysentery, sanguineous and hepatic flux, tenesmus and cholera, (cholera morbus,) has one on alvine fluxes in general (de alvi fluxibus in genere) and one on diarrhœa. In the chapter on alvine fluxes in general he gives a brief and clear exposition of the varieties of these fluxes, basing their subdivision into species on the characters of the matters excreted, the sources whence these matters proceed, and the several efficient causes which in different cases produce the disease, after which he treats at length of lientery and the cœliac affection. In the chapter on diarrhœa he treats of the varieties of that form of flux under the following heads: 1, de fluxu chyloso, 2, de diarrhœa à toto corpore cum febre; 3, de fluxu colliquativo; 4, de diarrhœa à toto corpore sine febre; 5, de diarrhœa à ventriculo et cibis corruptis; 6, de diarrhœa à vermibus; 7, de diarrhœa ab epate, ne bilioso humore; 8, de diarrhœa à liene et humore melancholico; 9, de diarrhœa ab utero, 10, de diarrhœa à cerebro; 11, de diarrhœa, quæ accidit infantibus, dum dentes erumpunt; 12, de diarrhœa ab hypercatharsi et veneno sumpto.—SENNERT,

Such distinctions as feculent diarrhœa, serous diarrhœa, mucous diarrhœa and bilious diarrhœa are still in common use, and correctly describe the varying character of the discharges. The use of these terms cannot be objected to, but it should be remembered that the stools are often successively feculent, bilious, serous and mucous during the same case, so that it seems hardly worth while to attempt to establish formal varieties of the disease on this basis, though an examination of the stools is important as an aid in determining the actual condition of the patient at the time of the examination.

Besides the variations in the consistency and quantity of the stools, they vary considerably in *color*, as already hinted. This is dependent, in part, upon the amount of biliary matter they contain and the degree of decomposition to which it has been subjected; in part upon the presence of blood, which can often be recognized by the microscope when its existence would not otherwise be suspected; and in part upon the introduction, along with the ingesta, of certain articles of food and medicine. Among articles of diet, spinach, coffee and porter have been mentioned by Osborne as furnishing coloring matters which resist the action of the digestive organs and impart their own color to the stools.* Among medicines, the preparations of iron† make the stools greenish-black or black, subnitrate or subcarbonate of bismuth brownish-black, sulphate of copper makes them dark green, while calomel gives rise to a green, greenish-brown, or yellowish-brown color, which has long attracted the attention of practitioners, and has exercised a powerful influence on the use of mercurials in the treatment of disease, because it has been attributed to an increased secretion of bile, but which is in reality due, in part at least, as has been shown by Lehmann, to the formation of sulphide of mercury by the action of the sulphuretted hydrogen contained

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*Pract. Med.*, Lib. III, Part. II, Sect. II, Cap. VI, De Diarrhœa. [*Loc. cit.*, p. 271 *supra.*] In the *Nosology* of SAUVAGES the order alvi fluxus is subdivided into twelve genera, viz: hepatirrhœa, hæmorrhois, dysenteria, melæna, nausea, vomitus, ileus, cholera, diarrhœa, cœliaca, lienteria and tenesmus. Of the genus diarrhœa he made twenty-one species, viz: 1, d. stercorosa; 2, d. vulgaris; 3, d. febrilis; 4, d. pituitosa; 5, d. carnosa; 6, d. variolosa; 7, d. acrasia; 8, d. biliosa; 9. d. arthritica; 10, d. serosa; 11, d. purulenta; 12, d. Chiliensis; 13, d. colliquativa; 14, d. verminosa; 15, d. à dentitione; 16, d. ab hypercatharsi; 17, d. choleriodes; 18, d. adiposa; 19, d. lactentium; 20, d. febricosa; 21. d. pleuriticorum. As the genera hepatirrhœa, cœliaca and lienteria of SAUVAGES were united with the genus diarrhœa by CULLEN, I subjoin their species: *Hepatirrhœa:* 1, h. vera; 2, h. intestinalis; 3, h. à vulnere; 4, h. mesenterica; 5, h. scorbutica; 6, h. cruenta; 7, h. intermittens. *Cœliaca:* c. chylosa; c. purulenta; c. mucosa; c. lactea. *Lienteria:* l. ex ulcere ventriculi; l. spontanea; l. scorbutica; l. aphthosa; l. secundaria.—*Nosologia Methodica*, Amsterdam, 1768, Tom. II, pp. 321 *et seq.* CULLEN, in the earlier editions of his Nosology, adopted, under the head of diarrhœa, most of the above species of Sauvages, dividing the series into idiopathic and symptomatic, and making in all fifteen of the former and twenty-four of the latter.—*Apparatus ad Nosologiam Methodicam*, Amsterdam, 1775, p. 216. Subsequently, however, he reduced the number of idiopathic species to six, as follows: *Idiopathic species*—1, d. crapulosa; 2, d. biliosa; 3, d. mucosa; 4, d. cœliaca; 5, d. lienteria; 6, d. hepatirrhœa; *Symptomatic species*—d. febrilis; d. febricosa; hepatirrhœa intermittens; diarrhœa variolosa; d. pleuriticorum; d. arthritica; d. colliquativa; d. choleriodes; hepatirrhœa vera; h. a vulnere; h. mesenterica; dysenteria a mesenterii vomica; diarrhœa purulenta; cœliaca purulenta; hepatirrhœa scorbutica; dysenteria scorbutica; lienteria scorbutica; l. ex ulcere ventriculi; l. aphthosa; l. secundaria; diarrhœa verminosa; d. a dentitione; d. Chiliensis; d. acrasia.—*Nosologia Methodica*, edited by JOHN THOMSON, Edinburgh, 1820, p. 114; also works by JOHN THOMSON, Edinburgh, 1827, Vol. I, p. 312. JOHN MASON GOOD reduces the list of species to eight, viz: 1, d. fusa; 2, d. biliosa; 3, d. mucosa; 4, d. chylosa; 5, d. lienteria; 6, d. serosa; 7, d. tubularis; 8, d. gypsata.—*The Study of Medicine*, Philadelphia, 1825, Vol. I, p. 153. Most modern writers are disposed to reduce the number of species very much; the tendency to make minute subdivisions still exists, however, in certain quarters. Thus, TROUSSEAU makes seven species: "J'admets donc sept espèces de diarrhées; l'une est la diarrhée catarrhale ou phlegmasique; la seconde est la diarrhée sudorale (je vous expliquerai plus loin ce que j'entends par là;) la troisième reconnaît pour cause une sécrétion exagérée de l'intestin se produisant sous l'influence de certains troubles de l'innervation; la quatrième est encore une diarrhée catarrhale, mais ici le catarrhe n'est survenu que consécutivement à un flux intestinal excessif; la cinquième espèce, je l'appelle diarrhée par excès de tonicité de l'intestin; la sixième dépend d'un vice dans l'alimentation, des mauvaises qualités des ingesta, mauvaises qualités qui peuvent être absolues ou relatives; la septième, enfin, se rattache à l'existence de maladies organiques."—*Clinique Médicale de l'Hotel-Dieu*, 2me édit., Paris, 1865, Tome III, p. 97; and HABERSHON describes six, viz: diarrhœa crapulosa, bilious diarrhœa, catarrhal or mucous diarrhœa, dysenteric diarrhœa, choleraic diarrhœa and melæna.—*Diseases of the Abdomen*, 2d edit., London, 1862, p. 362.

* JONATHAN OSBORNE, *On some Leading Facts to be recollected in the Examination of the Fæces in Disease.*—The Dublin Quarterly Journal of Medical Science, Vol. XV, 1853, p. 104.

† In connection with the action of iron, the effect of certain chalybeate waters in coloring the stools may be mentioned. Thus, CARL KERSTEN—*Ueber die Ursache der grünen Färbung der Stuhlentleerungen bei dem Gebrauche der Marienbader Mineralwässer*, Journal der Chir. u. Augenheilk. von v. Walther und v. Ammon, Bd. III, [Berlin, 1844.] Heft 2, S. 153—showed that the green color of the evacuations observed after a course of Marienbad waters, long supposed to be due to the evacuations of bile, was really due to the formation of the sulphuret of iron. These investigations were criticised by FRANKL—*Bemerkungen über die Ursache der grünen Färbung der Stuhlentleerungen bei dem Gebrauche der Marienbader Mineralwässer*, Heller's Archiv, Jahrgang 1845, Wien, S. 105—but BERZELIUS confirmed KERSTEN'S views, and extended them to the case of all chalybeate waters, remarking that every chalybeate water, whether it contains sulphates or not, produces a similar appearance in the evacuations. See an extract from a letter from BERZELIUS to KERSTEN, in v. Walther's u. v. Ammon's Journal, Bd. IV, [1845,] Heft 1, S. 161. According to WM. LAMBL—*Mikroskopische Untersuchungen der Darm-Excrete*, Prager Vierteljahrschrift, 1859, Bd I, S. 53—sulphate of copper given medicinally also bestows a characteristic color upon the stools, which become dark-green; the intensity of the color varying with the quantity of bile-pigment present. The effect may be imitated by adding sulphate of copper in solution to the stools.

in the intestinal canal.* This statement is supported by the carefully made observations of several other chemists, whose accordant testimony leaves no reasonable doubt with regard to the matter, notwithstanding the negative results of Simon. Lehmann, however, has declared that he was convinced, by his own analyses, of the occasional presence of an excess of almost unchanged bile in calomel stools, a circumstance which is by no means surprising, since it also occurs occasionally after the action of other purgatives, and in the course of diarrhœas in which no purgatives have been administered; moreover, Bamberger has pointed out† that the presence of an increased quantity of biliary matters in the stools is no certain indication of increased secretion of bile, since it may result from a diminution of the decomposition and reabsorption of the bile normally taking place in the intestinal canal, which is to be anticipated in view of the more rapid movement of the intestinal contents and the morbid condition of the absorbing surface.

A correct interpretation of the action of calomel on the quantity of the biliary secretion has special significance in connection with the question of its administration, as in many cases of diarrhœa and dysentery, in conditions characterized by a deficiency of biliary matters in the stools. Now, experiments on dogs would appear to show that, so far from calomel increasing the secretion of bile, it actually diminishes it. Such experiments had been published by Nasse,‡ Kölliker,§ Mosler,‖ and Scott,¶ but did not attract very much attention before the report to the British Medical Association in 1868, of the committee of which Bennett

* C. G. LEHMANN—*Physiological Chemistry;* translated by George E. Day, London; printed for the Cavendish Society, 1853, Vol. II, p. 145:—"My own investigations lead to the following conclusions: After calomel has been taken, we always find mercury in the stools, whether they be green, or black, or of their ordinary color; this had previously been distinctly established by Hermann, (*De Rationibus Dosium Calomellis, &c.*, Diss. Inaug. Hannïæ, 1839,) and even more strongly by Merklein, (*Ueber die grünen Stühle nach dem Gebrauche des Calomels im Typhösen Fieber*, Inauguralabhandlung, München, 1842.) Höfle has likewise convinced himself of the presence of mercury in the fæces in these cases. The sulphido of mercury may be separated, by rinsing, from the evacuation, when stirred in water, as Merklein was the first to observe, and its chemical nature may be then very easily recognized; the dark color of the sulphide of mercury, when finely comminuted, may certainly, like sulphide of iron, give rise to a light green color with animal substances, and especially with the yellow bile-pigment; indeed, powdered calomel, when triturated with yellowish-brown excrements, causes them, according to Hermann, to assume a greenish color. But, notwithstanding these facts, we should not deny the presence of almost unchanged bile in calomel stools, for we may with facility recognize the presence of bile-pigment by nitric acid, and of the resinous biliary acids, by Pettenkofer's test, in the alcoholic extract when carefully prepared; and this extract may usually be obtained in considerable quantity. Every one who himself analyses such stools is, at all events, led to the subjective conviction that a part of the green and light color may be dependent on bile-pigment." On the other hand, SIMON—*Animal Chemistry*, translated by G. E. Day, London, 1846, Vol. II, p. 387—tells us: "Various attempts that I made (by Smithson's method) to detect mercury in calomel-stools proved unsuccessful;" and GOLDING BIRD—*On the nature of the green alvine evacuations of children*, The London Medical Gazette, Vol. I, N. S., 1845, p. 801—examined one green stool passed "by a hydrocephalic infant whilst under the influence of mercury," and arrived at the conclusion that the green color was due to the presence of altered blood, and that "the green stools alluded to are but a form of melœna." H. C. WOOD, Jr.—*A Treatise on Therapeutics*, Philadelphia, 1874, p. 384, also 2d ed., 1876, p. 434—refers to these negative observations of SIMON and GOLDING BIRD as proof that mercury does not exist in the green stools, but does not mention the positive testimony of HERMANN, MERKLEIN, HÖFLE and LEHMANN to the fact that it always does. The opinion of LEHMANN, just quoted, that unchanged bile may exist also in the calomel stools, is supported by the earlier testimony of MICHÉA—*Le calomel exerce-t-il une influence spéciale sur la sécrétion biliaire?* L'Union Médicale, 1848, No. 125, p. 495, and No. 126, p. 500—who tested the stools by mixing them with twice their volume of distilled water, filtering, and adding nitric acid. No quantitative procedure was attempted by him. The stools of six healthy persons being treated in this way no color was produced. Those of three cases of gastro-intestinal affections were examined in the same way; in only one of them was much bile indicated by the nitric-acid test. Calomel was given to eight persons in doses varying from six decigrammes to a gramme. In but four of these cases did green stools result from its action. In two of these four cases the characteristic play of colors was produced by nitric acid, though the green was not as beautiful as usual in the reaction with bile. In the other two no green was produced, but a reddish-yellow, (un jaune fauve,) and it was almost without any subsequent transformations. Nevertheless, MICHÉA concluded that bile was present in these as well as the other two cases, because in all four the precipitate produced by nitric acid showed the presence of albumen, which he appears to have thought must be derived from the bile. Finally, the stools of five persons who had taken neutral salts, or resinous purgatives, gave no reaction with nitric acid. The crude character of the chemistry of these experiments renders criticism at the present time quite unnecessary. They prove nothing, and yet they continue to be appealed to by those who wish to believe that calomel is a cholagogue.

† Page 218 of Work, cited on page 266.

‡ H. NASSE—*Commentatio de bilis quotidie a cane secreta copia et indole*, Marburgi, 1851, quoted in SCHMIDT'S *Jahrbücher*, Bd. 73, [1852,] S. 274–77, and CANSTATT'S *Jahresbericht*, 1852, Bd. I, S. 153—arrived at the conclusion, from experiments on dogs with biliary fistulæ, that although calomel increases the absolute quantity of bile, it diminishes its solid ingredients. Fever and diarrhœa, he found, diminished the quantity secreted.

§ A. KÖLLIKER and H. MÜLLER—*Bericht über die während der Sommersemester 1853 und 1854 in der physiologischen Anstalt der Universität Würzburg angestellten Versuche*, Würzburg Verhandlungen, Bd. V, 1855, S. 213—administered four grains of calomel to a dog with biliary fistula, and observed at first a slight increase, but next day a slight diminution, in the amount of bile. On repeating the dose of calomel a second and third time the quantity of bile diminished without any previous increase.

‖ FRIEDRICH MOSLER—*Untersuchungen über den Uebergang von Stoffen aus dem Blute in die Galle*, Virchow's Archiv, Bd. XIII, 1858, S. 41—administered calomel to two dogs with biliary fistulæ, and arrived at the conclusion that this drug neither passes so speedily into the bile, nor produces so marked an increase in the quantity of that fluid, as we are inclined to assume in practical medicine.

¶ GEORGE SCOTT—*On the Influence of Mercurial Preparations upon the Secretion of Bile*, Beale's Archives of Medicine, Vol. I, 1859, p. 209—gave calomel in large doses four times, with intervals of a few days, to a dog with biliary fistula, and found in every case "a diminution in the amount of fluid bile and bile-solids secreted."

was chairman.* The elaborate character of the researches upon which that report was based, and the high character of the reporter, gave it great weight, and, notwithstanding the objections made in various quarters, its conclusions have been widely adopted. More recently Röhrig experimented on wourarized dogs with large doses (20 grains) of calomel, and obtained contrary results,† the secretion of bile appearing actually to increase after

* *Report of the Edinburgh Committee on the action of Mercury, Podophylline and Taraxacum, on the biliary secretion;* by JOHN HUGHES BENNETT, Part I, The British Medical Journal, Vol. II for 1868, p. 78; Part II, *ib.*, Vol. I for 1869, p. 411. In these researches the committee operated on forty-one dogs for the establishment of biliary fistulæ, and succeeded in obtaining nine animals with well-established fistulæ. A series of experiments on one of these dogs with blue-pill, and on four of them with calomel, led to the conclusion that both blue-pill and calomel, in purgative doses, diminish the biliary secretion, and that in doses too small to purge they do not increase it. The committee also show by experiment that the action of mercury upon the salivary glands, mouth, intestine, appetite and general nutrition of the dog is the same as its action on man, except that proportionately larger doses are required to produce a given effect, and they hence infer that its action on the liver is the same in both. Experiments on three of the dogs with corrosive sublimate led to the conclusion that this preparation also does not, in small doses, increase the biliary secretion, and diminishes it if given in doses sufficient to produce purgation, or if its action is kept up long enough to impair the general health. Experiments with podophylline showed that in small doses it diminished the solid constituents of the bile, and in purgative doses, both the fluid and the solid. Taraxacum, in doses of from sixty to two hundred and forty grains, affected neither the biliary secretion, the bowels nor the general health of the animals to which it was given. Several of the dogs suffered from spontaneous diarrhœa, and one of them from dysentery, while under observation. In all these cases a diminution in the quantity of the bile was observed. It has been objected to these experiments that being made on dogs the results do not apply to man. See the remarks of the President of the British Association, (Dr. ACLAND,) at the Oxford meeting.—The British Medical Journal, Vol. II for 1868, p. 176; see also A. W. BARCLAY, *Action of Mercury on the Liver, ib.*, Vol. I for 1871, p. 49. Moreover, four members of the Edinburgh committee, R. CHRISTISON, D. MACLAGAN, T. R. FRASER, and ARTHUR GAMGEE, have published letters—*ib*, Vol. I for 1869, p. 483—in which they express the opinion that the reporter has drawn conclusions not fully warranted by the experiments. (See Dr. Bennett's reply to these letters, *ib.*, p. 503.) These gentlemen, however, do not impugn the accuracy of the experiments themselves; indeed, both Fraser and Gamgee took a prominent part in their performance. Numerous articles in favor of the views of the committee, and opposed to them, have since appeared in the Medical Journals, but none, which have met my eye, are based upon experimental observations except those of Röhrig and Rutherford, mentioned below. One of the most interesting and ingenious of these articles is that by THOMAS R. FRASER—*Sketch of the present state of our knowledge respecting the action of mercury on the liver*, Edinburgh Med. Jour., Vol. XVI, 1871, p. 994, which contains the best presentation of the argument in favor of the old doctrine of the cholagogue action of mercury with which I am acquainted, with copious references to the literature. It may serve to indicate how little proof there is of the truth of the old view to mention the remark of this writer, that the observations of MICHÉA, cited above, constitute "the most satisfactory and convincing evidence on the subject." I confess to some surprise at finding my friend H. C. WOOD, Jr., (*op. cit., supra*, on p. 275,) among those who refuse to be convinced by experiments on dogs. This writer, in spite of the earnestness with which he combats the objection, "that drugs do not act upon the lower creatures in the same manner as they do upon man," (*op. cit.*, preface to first ed., p. 7 *et seq.*,) when he comes to discuss the calomel question, remarks that "The canine diet and digestion are so different from the human, that it is to be expected that medicines acting upon the digestive apparatus will influence dogs differently from man." Hence he concludes that experimental evidence must be "all laid aside when we desire to study the question as to the cholagogue action of remedies upon man, and that our conclusions must be based solely upon clinical evidence," (*op. cit.*, 1st ed., p. 374; 2d ed., p. 423.) Like FRASER, from whose article he appears to borrow largely, he regards the observations of MICHÉA as "the most satisfactory evidence" in favor of the cholagogue action of mercury; but apparently, from not consulting the original paper, he mistakes the results arrived at by that inquirer, making them appear very much more "satisfactory" than they really were, remarking: "Calomel having been given to eight healthy persons, five men and three women, bile was readily demonstrated in the green passages produced in all of the subjects," (*op. cit.*, 1st ed., p. 384; 2d ed., p. 435,) whereas MICHÉA himself only claimed this result in four of the eight cases. Even experiments on dogs are less uncertain than this kind of "clinical evidence." CHARLES MURCHISON—*Croonian lectures on functional derangements of the Liver*, Lancet, May, 1874, p. 611—has recently suggested that "the difference of opinion between the physiologist and the practical physician" on this subject may be reconciled by considering that "a large part of the bile secreted by the liver and thrown into the bowel is constantly being reabsorbed, to reach the liver again; and accordingly, when the common bile-duct is tied, and a fistulous opening into the gall-bladder established, the quantity of bile which escapes from the fistulous opening immediately after the operation is much greater than at any time subsequently, (SCHIFF.) Mercury and allied purgatives produce bilious stools by irritating the upper part of the bowel, and sweeping on the bile before there is time for its reabsorption." In this way he thinks mercury relieves "a loaded liver far more effectually than if it acted merely by stimulating the liver to increased secretion, as was formerly believed, and as some authorities still maintain; for in this case it might be expected to increase, instead of diminish, hepatic congestion." This suggestion has been still further elaborated by T. LAUDER BRUNTON—*On the action of purgative medicines*, The Practitioner, June, 1874, p. 403—who also holds, on the basis of the experiments of SCHIFF, that a portion of the bile poured into the intestinal canal is reabsorbed and again excreted, so that—"In the normal state of the animal the liver is always doing two things: it is *forming* new bile, and it is *excreting* old bile which it has received from the intestine by means of the portal vessels," p. 411. "If the peristaltic action of the whole intestinal canal is quickened by a purgative, the bile will be hurried rapidly onwards and evacuated before there has been time for its reabsorption, and the liver being thus relieved will be able to excrete any bile still remaining in the blood," p. 413. SCHIFF—*Gallenbildung, abhängig von der Aufsaugung der Gallenstoffe*, Pflüger's Archiv, 3te Jahrgang, 1870, S. 598—found, in the experiments on which the view advocated by MURCHISON and BRUNTON depends, not only that the quantity of bile which escapes from a biliary fistula is much greater immediately after the operation than it subsequently becomes if none is allowed to enter the intestinal canal, but also that if the animal has at the same time a duodenal fistula, and the bile escaping from the biliary fistula is injected into the duodenum, the quantity which escapes speedily increases to a degree proportional to the quantity thus injected. Ox-gall injected into the duodenum produces the same effect. These results may be verified by means of what SCHIFF calls an "amphibolen gallenfistel;" that is, a simple biliary fistula made with a wide canula (1.3 to 1.5 centimetres in diameter) and without ligation of the common duct. If the canula is corked, the bile follows its normal course; if the cork is taken out, the bile all escapes externally, the pressure not being sufficient for any of it to enter the intestine. In such dogs the quantity of bile which escapes externally during ten minutes' observation, if the fistula had previously been kept closed for some hours, is nearly three times as great as if it had been left open.

† A. RÖHRIG.—*Experimentelle Untersuchungen über die Physiologie der Gallenabsonderung*—STRICKER'S Jahrbücher, 1873, Heft II, S. 254. I am not satisfied of the value of these researches. The animals were paralyzed by wourara, and artificial respiration kept up by means of a tube inserted into the trachea. Instead of making a biliary fistula the abdominal cavity was opened, a tube inserted into the biliary duct, and the rapidity of the secretion estimated by the frequency of the drops as measured by the beats of a metronome. The following is a translation of the passage which refers to the action of calomel: "Large doses of calomel (twenty grains for a dog) seldom succeeded in renewing the flow of bile if it had entirely ceased, although the drug named is capable of improving the merely slackened production of bile in a certain manner. As is well known, calomel has for a long time played a great role as a means of promoting the secretion of bile; on the other hand, Scott (Arch. of Med., Vol. I, p. 209) has denied this opinion, and thought himself able to afford experimental proof that it would diminish the bile secreted in a unit of time. I certainly saw, in two corresponding cases, that the secretion of bile which had completely ceased was, by the introduction into the intestine of an emulsion of twenty grains of calomel, again reproduced after about two hours in such a way that a drop flowed every 129–130 beats of the pendulum. An hour later the secretion flowed at the rate of a drop to 85 beats in one case, a drop to 70 in the other; a speed which again diminished after thirty minutes, and entirely ceased after thirty-five

the use of the drug; he referred in his paper to the investigations of Scott, but did not mention those of the Edinburgh committee, and his experiments were not made under conditions which can be regarded as very satisfactory. The latest investigations into this matter with which I am acquainted are those of Rutherford and Vignal,* which were undertaken with full knowledge of the labors of their predecessors, and with every known precaution to secure accuracy. These experiments afford substantial support to the conclusions of the Edinburgh committee, so that while it may be admitted that further investigation is desirable, it must be conceded that the weight of the experimental evidence thus far accumulated is against the opinion that the secretion of bile is increased by calomel.

Besides the foregoing ingredients, *fragments of undigested food* frequently make their appearance in the stools. Bits of hard bread, scraps of undigested meat, the husks of peas and beans, the seeds of fruits, and many similar articles, can often be detected with the naked eye; and even when this is impossible, microscopical examination almost invariably detects the debris† of the food in still larger quantities than are ordinarily present in healthy

more. On the other hand, when the mere acceleration of a still existing secretion was concerned, calomel showed itself more certain, and afforded very nearly the same results as I have already fully detailed for the sulphate of magnesia." In the experiment with sulphate of magnesia here referred to, fifty cubic centimetres of a saturated solution of sulphate of magnesia were injected into the intestines of a dog whose secretion had diminished to a drop every 96–98 beats; the flow increased in frequency to one drop every 34 beats in an hour and a half, after which it again diminished, and ceased entirely four hours after the commencement of the experiment. The fact that these experiments were made upon animals with their abdominal cavities laid open, and that they hence necessarily continued so short a time after the administration of the drug, must materially shake our confidence in the value of the results. If they prove anything at all as to calomel, they show only that it is almost as active a cholagogue as Epsom salt.

* WM. RUTHERFORD and M. VIGNAL—*Experiments on the biliary secretion of the Dog*, Jour. of Anat. and Physiology, Vol. X, [1876,] p. 252, and Vol. XI, p. 61—point out that the experiments of RÖHRIG were performed upon fasting animals, while the Edinburgh committee used animals which were not fasting. Their method of investigation was a modification of that of RÖHRIG. Dogs which had fasted eighteen hours were curarized and artificial respiration set up. The abdomen was then opened, a glass canula was tied in the common bile-duct, the cystic duct was clamped, and the bile which flowed through the canula was carefully collected and measured every fifteen minutes, instead of counting drops, the size of which would vary with the varying viscidity of the bile. The medicines experimented with were injected directly into the duodenum. After the canula was inserted the wound in the abdomen was closed, and the animal covered with cotton-wool to enable it to regain its normal temperature. They also analyzed the bile in many cases, and made post mortem examinations of the condition of the alimentary canal. Four dogs were thus experimented on with calomel. In three instances, two doses of ten grains of calomel each were given an hour or more apart; in the fourth, four doses of three grains each were given. In all four cases the calomel had a purgative effect. In one of the cases in which two ten-grain doses were given the quantity of bile excreted was increased: it was 3.35 cubic centimetres during two hours before the administration of the calomel, 4.25 cubic centimetres during the two hours following the first dose, and 4.72 cubic centimetres during the two hours following the second. In the other three cases the quantity of bile was positively diminished. In the case in which four three-grain doses were given, the bile was analyzed before and after the action of calomel, with the following results:

| | BEFORE IT WAS GIVEN. | AFTER THE THIRD DOSE. |
|---|---|---|
| Water | 86.00 | 87.78 |
| Bile-acids, pigments, cholesterine, fat | 8.40 | 7.85 |
| Mucus | 4.57 | 3.40 |
| Ash | 1.03 | 0.97 |
| | 100.00 | 100.00 |
| Velocity of secretion per half hour | 0.78 c. c. | 0.4 c. c. |

From this it is seen that the bile was not only rendered more scanty, but more watery, by the action of calomel. With regard to the single case in which the quantity of bile appeared to be increased, the authors ask: "In consideration of the negative results as regards the cholagogue action of calomel in Exps. 31, 32 and 33, is it not possible that the increase in the biliary secretion observed in Exp. 30 might have taken place during the course of the experiment had no calomel been given?" The authors experimented with a number of substances, some of which, as for example podophylline and ipecacuanha, produced a marked increase of the biliary secretion. The same effect was also produced by the inhalation of chloroform, (*op. cit.*, Vol. XI, p. 62.) It may be added that RUTHERFORD was a junior member of BENNETT'S committee, and, in connection with GAMGEE, performed the experiments which formed the basis of its report, so that he has had considerable experience in matters of this kind.

† On the presence of such debris in healthy fæces and on the composition of the healthy fæces generally, consult BERZELIUS—*Analyse de la Matière Excrémentitielle de l'Homme*, Annales de Chimie, Tome LXI, (1807,) p. 314; WEISSARG—*Mikroskopische und Chemische Untersuchungen der Fæces gesunder, erwachsener Menschen*, Giessen, 1853; I have not been able to see this thesis, an abstract of which is given in the British and Foreign Medico-chirurgical Review, Vol. XIV, 1854, p. 528; J. F. SIMON—*Animal Chemistry;* translated by George E. Day, London, 1846, Vol. II, p. 366; LEHMANN—*Physiological Chemistry;* translated by George E. Day, London, 1853, Vol. II, p. 141; W. MARCET—*An Account of the Organic Chemical Constituents or Immediate Principles of the Excrements of Man and Animals in the Healthy State*, Philosophical Transactions, Vol. CXLIV, 1854, p. 265; also the same, *On the Immediate Principles of Human Excrements in the Healthy State*, Ib., 1857, Vol. CXLVII, Part I, p. 403; and AUSTIN FLINT, jr.,—*The Physiology of Man*, Vol. II, *Alimentation, Digestion*, &c., New York, 1867, p. 393 *et seq.*

fæces. The presence of undigested food in considerable quantities and recognizable by the naked eye constitutes the condition known to the ancients as lientery, which is more common in the chronic forms of diarrhœa and dysentery, and which will be referred to again hereafter.

*Chemical examinations* of the stools in diarrhœa have been made by Simon,* Lehmann,† Ihring,‡ and others. They still leave much to be desired. One of the most important facts established is the presence of considerable quantities of albumen in the liquid discharges.§

On *microscopical examination*, besides debris of food in quantities largely dependent upon the character of the diet, we find: 1. Corpuscles similar to the white corpuscles of the blood, which may be described as mucous corpuscles when they occur in glairy masses of mucus visible to the naked eye; as pus-corpuscles when they are thickly crowded together in an albuminous serum so as to form a yellowish opaque fluid. This latter condition is more common in acute and chronic dysentery. In either case the appearances presented by the corpuscles are identical, and their origin is probably the same; that is, they are to be regarded as white blood-corpuscles which have migrated into the intestinal tube from the bloodvessels of the inflamed mucous membrane. The number of these bodies, and their association with mucus or their aggregation as pus, afford valuable indications as to the intensity of the inflammatory process. 2. Red blood-corpuscles, variously deformed by their sojourn in the intestines, can often be recognized when the presence of blood cannot be detected by the naked eye. In consequence of the changes they have undergone they often give to the stools a blackish or brownish hue. Much more common in chronic cases, in dysentery, and in the peculiar diarrhœa of typhoid fever, they nevertheless are frequently encountered in considerable quantities in severe cases of acute diarrhœa. 3. Epithelial elements derived from the intestinal mucous membrane have also been observed, but according to my observations are not of frequent occurrence. 4. Crystals of the triple phosphates of ammonia and magnesia are very commonly found whenever the liquid stools are alkaline, which is usually the case. 5. Besides the foregoing, various low vegetable forms are of constant occurrence. These have recently acquired considerable interest on account of their supposed relation to the causation of diarrhœa, as similar organisms have been supposed to act as the cause of dysentery, typhoid fever, cholera morbus, Asiatic cholera, and other diseases. Their occurrence in the stools of diarrhœa will, however, appear less significant if their abundance in the normal fæces is fully understood.

My own observations have satisfied me that a large part of the substance of normal human fæces is made up of these low forms, in numbers which must be estimated by hundreds of millions in the fæces of each day. When a small fragment of the normal fæces, taken immediately after it is voided, is shaken into an emulsion with distilled water and examined with an adequate power, these forms are found floating in countless multitudes along with fragments of partly digested muscular fibres and other debris from the food. They consist of extremely minute spherical elements, elongated rod-like forms, and larger elliptical bodies, resembling torula cells. All these can be recognized by a practiced observer with a good $\frac{1}{5}$th of an inch objective, but for their closer study the highest powers of

* *Loc. cit.* † *Loc. cit.*

‡ IHRING—*Mikroscopisch-Chemische Untersuchungen menschlichen Fæces unter verschiedenen Pathologischen Verhältnissen*, Inaug. Diss., Giessen, 1853. I have not seen this thesis, a short abstract of which will be found in the British and Foreign Medico-Chirurgical Review, Vol. XIV, 1854, p. 529.

§ According to IHRING, albumen is found in the stools of dysentery and various forms of diarrhœa, but not in the loose discharges produced by purgative medicines administered to healthy individuals.

the microscope are desirable. I have found immersion objectives of $\frac{1}{10}$th to $\frac{1}{25}$th of an inch equivalent focal length best adapted to the investigation; with these, by proper eye-pieces, quite as high powers can be obtained as are given by objectives of shorter focal length, and with better definition. The spherical elements are the most numerous of all; they are smooth, transparent, highly refractive bodies, which vary from $\frac{1}{20000}$th to $\frac{1}{30000}$th of an inch in diameter or even less, and are in continual active movement. If a drop of the emulsion is placed beneath a thin cover and a ring of varnish applied to the edges to prevent evaporation, this motion will be found to continue indefinitely. Between these elements and the rod-like ones all possible transition forms exist. The rod-like bodies themselves are similar in their appearance to the spherical ones in everything except form, and are exceedingly numerous. They may attain the $\frac{1}{8000}$th or even the $\frac{1}{3000}$th of an inch or more in length without exceeding the $\frac{1}{20000}$th of an inch in breadth. As a rule, they do not possess the active movements of the spherical elements, but float with the currents of the fluid, remaining stationary when it comes to rest, or progressing slowly with a slight sinuous motion. On the other hand, rod-like bodies quite similar to the others are frequently observed, which appear to possess a proper motion as active as that of the spherical forms. The rod-like bodies often occur in pairs placed end to end; sometimes several of them are thus arranged in the form of a filament. The spherical elements are also frequently arranged in little chains like strings of beads. As far as can be ascertained, the foregoing forms do not differ from those ordinarily encountered in putrescent nitrogenous mixtures. They constitute in their totality what Béchamp and Burdon-Sanderson have described under the designation of microzymes,* and Billroth† under that of coccobacteria septica. The spherical forms are the micrococcus of Hallier,‡ the sphærobacteria of Cohn;§

FIG. 2. Minute vegetable forms from normal fæces, × 1900 diam. by Powell and Lealand's 1-16th immersion. **a**, Spherical elements, (Micrococcus.) **b**, Rod-like bodies, (Bacteria.) **c**, Filaments composed of both the foregoing. **d**, Torula-like cells.

* A. BÉCHAMP—*Note sur les granulations moleculaires des fermentations et des tissus des animaux.* (Read to the Acad. of Sciences, Feb. 24, 1868.) Arch. Gén. de Méd., 1868, T. I, p. 492. BURDON-SANDERSON—*Introductory Report on the intimate Pathology of Contagion*—Twelfth Report of the Medical Officer of the Privy Council, for 1869, London, 1870, p. 245; also, *Further Report on the intimate Pathology of Contagion*—Thirteenth Report of the same, for 1870, London, 1871, p. 48.

† THEODOR BILLROTH—*Untersuchungen über die Vegetationsformen von Coccobacteria Septica und den Antheil, welchen sie an der Entstehung und Verbreitung der accidentellen Wundkrankheiten haben*, Berlin, 1874. According to this author all the vegetable forms as yet observed in contagious diseases, as well as in the various forms of putrefaction which interest the physician and surgeon, belong to the several stages of development of one genus, which he classes with the algæ, and designates *Coccobacteria septica*. The spherical forms he calls *coccos*, and groups them in accordance with their small, medium or comparatively large size, as *micrococcus, mesococcus* and *megacoccus;* chains or filaments composed of the spherical forms arranged in rows, he names *streptococcus;* pellicles of the same, *petalococcus;* masses of them held together by a slimy or gelatinous material, *gliacoccus*. The rod-like bodies which he designates *bacteria* are also spoken of according to their size, as *micro-, meso-* and *megabacteria;* in filaments composed of segments placed end to end, as *streptobacteria*, in pellicles as *petalobacteria*, and in gelatinous masses as *gliabacteria*. Bacteria develop out of coccus under various circumstances; moreover, in the bacteria-rods there are developed under particular conditions certain minute dark contoured spherical bodies, which are the true spores (Daursporen) of the plant, which resist extremes of heat and cold, which are not destroyed by drying, and which are hence the most important agents in the transmission of coccobacteria from place to place. When these spores meet a suitable soil they develop into coccus, or bacteria, or both.

‡ For the titles of HALLIER'S various papers see a subsequent note.

§ FERDINAND COHN—*Untersuchungen über Bacterien*, Beiträge zur Biologie der Pflanzen, Bd. I, Heft 2, Breslau, 1872, S. 127; Bd. I, Heft 3, Breslau, 1875, S. 141; Bd. II, Heft 2, Breslau, 1876, S. 249—does not accept the view of BILLROTH that the rod-like forms develop out of the spherical ones. In the first paper cited he offered the following provisional classification of the forms in question. Tribe I, Sphærobacteria, (Sphere-bacteria.)

the rod-like ones were formerly called vibrios, but are now generally known as bacteria; the filaments and chains have been designated leptothrix by Hallier, streptococcus and streptobacteria by Billroth, desmobacteria by Cohn. The torula-like cells are elliptical in form, with a double contour and faintly granular contents. Usually they contain a single central nucleolus-like body, sometimes two of them. They occur singly, or in chains of two or three cells, in which case one is usually much smaller than the others. The number of these elements in the healthy fæces is small as compared with the innumerable swarm of spherical and rod-like bacteria; it is, moreover, exceedingly variable; never, however, have I found them entirely absent.

The presence of micrococci, bacteria and torula-like forms in the normal fæces has been heretofore noted by several observers.* Hallier† himself has pointed out that micrococci occur abundantly in the contents of the human intestinal canal in the healthy condition. But these observations have not attracted the attention they deserve, and most of the modern text books on physiology make no mention of the presence of these vegetable forms in their account of the fæces.‡

In the stools of acute diarrhœa, and indeed of acute and chronic dysentery, the low vegetable forms just described are invariably present, and no other more specific forms have as yet been observed.§ The micrococci and bacteria do not appear to be more numerous than in healthy fæces; but it frequently happens that the torula-like forms occur much more abundantly than in the normal condition. This especially happens in chronic cases, in which the starchy elements of the food are passed in a partly digested condition, consti-

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Genus 1, Micrococcus. Tribe II, Microbacteria, (Rod-bacteria.) Genus 2, Bacterium. Tribe III, Desmobacteria, (Thread-bacteria.) Genus 3, Bacillus. Genus 4, Vibrio. Tribe IV, Spirobacteria, (Screw-bacteria.) Genus 5, Spirillum. Genus, 6, Spirochæte. In the second paper he energetically combats the views of BILLROTH, and not only maintains these genera, but adds many others, making a still more elaborate classification which embraces about forty genera. He regards these organisms as more nearly allied to the algæ (especially to the *Phycochromaceæ*) than to the fungi, (p. 201,) and suggests the term *Schizophytæ* as a better family name than *Schizomyceten* proposed by NAEGELI, which is only applicable on the supposition that they are allied to the fungi.

* Thus, GROS—*Observations et Inductions Microscopiques sur quelques Parasites*, (Extr. du Bullet. de la Société Imp. des Natur. de Moscou, Tome XVIII, 1845,) p. 51—states that human excrement, whether healthy or diseased, swarms with vibrios: "les excréments humains ou sains ou malades fourmillent de vibrions de grandeur diverse." He adds: "Les médicaments ne semblent pas en diminuer le nombre et la vivacité." FRERICHS—*Wagner's Handwörterbuch der Physiologie*, Ed. III, Abth. 1, Braunschweig, 1846, S. 869—under the head of "Pilzbildung im Verdauungscanal," mentions, besides the occurrence of torula cerevisiæ, certain thread-like forms ("Fadenpilze") and their accompanying spores, which he states are found in the large intestine, where, as usual with these forms, they precede and accompany that spontaneous putrefaction which frequently occurs in the lower part of the intestinal tract. He figures these filaments and spores in Taf. V, Fig. 15. F.A. LONGET—*Traité de Physiologie*, 2me édit., T. I, Paris, 1861, p. 284—says, speaking of the contents of the digestive tube: "On rencontre très souvent des coeferves qui se développent sur le contenu de l'intestin, sans troubler la digestion; d'autres fois leur formation est un signe que la digestion est altérée par quelque disposition morbide des organes." FREY—*Das Mikroskop und die Mikroskopische Technik*, 5te Auflage, Leipzig, 1873, S. 269—"Der Koth des Menschen ist stets sehr reich an Fäden und Trümmern der Leptothrix." OTTO HAUSMANN—*Ueber Vibrionäre Parasiten*, Inaug. Diss., Berlin, 1870, S. 28—states that bacteria are more numerous and more fully developed in fluid stools, whether due to disease or the administration of medicines, than in the more solid healthy excrement; which does not agree with my own observations. He does not, however, think that they can be regarded as the cause of diarrhœal diseases: "Diese Thatsachen beweisen vollkommen, dass die Vibrionen an Diarrhœn und Cholera-Zufällen vollkommen unschuldig sind," S. 29. According to BILLROTH (*op. cit.*, p. 94) the meconium of new-born children contains no trace of these vegetable forms, but even the very first yellow stool of the new-born child is rich in them. The contents of the human stomach, as found in autopsies made shortly after death, and of the stomachs of animals just killed, usually present but few of these forms; on the other hand, they abound in the small intestine, and especially in the large—"Der Dünndarm aber und besonders der Dickdarm ist voller mittelgrosser theils ruhender, theils beweglicher Vegetationen der Fäulnissalge." In the diarrhœal stools of patients suffering with typhus, lead-colic and traumatic peritonitis, examined just after they were passed, mesobacteria, single and in chains, were as abundant as in putrefying flesh-water; but the same was true of the fluid stools of a healthy woman who, a few hours before, had taken a saline purge, (eine grosse Dosis Bitterwasser.)

† *Pilz-Regulativ*, Jena, 1870, S. 20; also *Parasitologische Untersuchungen, bezüglich auf die pflanzlichen Organismen bei Masern, Hungertyphus, Darmtyphus, Blattern, Kuhpocken, Schafpocken, Cholera nostras*, &c., Leipzig, 1868, S. 65. See also the translation of this essay in Vol. III of the Publications of the Massachusetts Medical Society, Boston, 1872, p. 344.

‡ See, for example, WILLIAM B. CARPENTER—*Principles of Human Physiology*, 7th edit., London, 1869, p. 149; JOHN C. DALTON—*A Treatise on Human Physiology*, 5th edit., Philadelphia, 1871, p. 148; AUSTIN FLINT, jr.—*The Physiology of Man*, Vol. II, *Alimentation, Digestion*, &c., New York, 1867, p. 393. Dr. LIONEL S. BEALE—*The Microscope in its Application to Practical Medicine*, Am. reprint of the 3d London edit., Philadelphia, 1867, p. 194—in his account of the microscopical "examination of matters passed by the bowels," though he states that "vast numbers of vibriones, with different kinds of vegetable fungi, are not uncommonly found" in the stools of typhus, makes no mention of their occurrence in the normal fæces.

§ For HALLIER'S account of the fungus supposed to cause diarrhœa, see his elaborate essay, *Die Parasiten der Infectionskrankheiten*, Zeitschrift für Parasitenkunde, Bd. 1, 1869, S. 174; also Taf. IV, fig. 51; for that of dysentery, see the same essay, S. 176, and Fig. 52 of the same plate. The forms represented in the two figures are remarkably like those always encountered in normal human excrement, a resemblance which Hallier himself expressly admits, S. 175. The low vegetable forms in diarrhœa stools have also been described by J. M. KLOB—*Path.-Anat. Studien über das Wesen des Cholera-processes*, Leipzig, 1867—who found groups of bacteria, (Bacterienhäufchen,) short filaments (Leptothrix-Gliederketten) and micrococci, (Schwärmsporen.) These elements offered no characteristic differences from those observed by the same author in the stools of dysentery and Asiatic cholera.

tuting the gelatinous-looking masses which will be described hereafter in connection with the stools of dysentery.*

This apparent identity of the cryptogamic forms found in the stools of diarrhœa and dysentery with those that swarm in normal excrement might seem to dispose of the hypothesis that they produce the morbid conditions in which they occur. But this objection has been met by Hallier† with the assertion that the organic forms actually observed in these several conditions are merely immature phases of higher organisms, and that although they may appear to be identical they are in reality diverse. This he claimed to have demonstrated by his culture experiments, in which the micrococci derived from various diseases seemed to develop, in part at least, into characteristic species of microscopic fungi peculiar to each disease.

But those who have most carefully repeated Hallier's experiments have not obtained identical results. De Bary and Hoffmann‡ have shown that, altogether aside from the question of their pathological significance, his hypotheses are untenable from the strictly botanical point of view. In fact the vegetable forms in question are so minute, occur in such countless multitudes, and are so often inseparably intermixed in the same fluid, that their natural history offers excessive difficulties. Burdon-Sanderson§ in some of his experiments saw torula forms originate in vast numbers, and develop into luxuriantly fructifying fungi (e. g. penicilium, &c.,) without the appearance of any microzymes in the fluid; and the weight of evidence certainly appears to be against the notion that these lower forms ever develop into higher ones. The relation of the lower forms to each other, however, offers such difficulties that the botanists themselves have been unable to agree with regard to it. According to Burdon-Sanderson, the spherical forms (micrococcus) develop into the elongated ones, (bacteria,) and these again elongate by cell-division into filaments. Billroth‖ adopts the same view, and describes the formation in the elongated forms of resting spores (Dauersporen) by the multiplication of which the spherical forms are again generated. According to this view, the spherical forms, the rods and the chains, constitute but a single genus, which presents a great variety of appearances in accordance with the stage of its development and the soil on which it is grown. On the other hand, there are botanists who, like Cohn,¶ regard the transformation of the spherical forms into rods and chains as undemonstrated, and think these low forms constitute several independent genera, with regard to the exact number and limits of which there is much diversity of opinion. These humble forms arise whenever nitrogenous substances putrefy,** and hence make their

* The torula-like forms, under these circumstances at least, would appear to be identical with the ordinary yeast fungus. Their occurrence in the stools under the circumstances mentioned in the text has been especially insisted upon by J. H. SALISBURY—*Chronic Diarrhœa and its Complications*, &c., &c.—in the Annual Report of the Surgeon General of Ohio for 1864, p. 25.

† With regard to HALLIER'S views as to the specific fungi of various diseases, see, besides the papers already quoted, *Die Pflanzlichen Parasiten des menschlichen Körpers*, Leipzig, 1866; *Gährungserscheinungen: Untersuchungen über Gährung, Fäulniss und Verwesung, mit Berücksichtigung der Miasmen und Contagien sowie der Disinfection*, Leipzig, 1867; *Das Cholera-Contagium*, Leipzig, 1867; (see also an abstract of this essay by Dr. Buchanan, in the *Ninth Report of the Medical Officer of the Privy Council*, London, 1867, p. 512.) *Phyto-pathologie*, Leipzig, 1868; also various essays in the Zeitschrift für Parasitenkunde, Jena, 1869, and subsequently, besides the essay, *Die Parasiten der Infectionskrankheiten*, already quoted, which is continued as a serial in that journal, Bd. I, S. 117 and 291; Bd. II, S. 67 and 113; Bd. III, S. 7 and 157, and Bd. IV, S. 56.

‡ A summary statement of the objections of DE BARY and H. HOFFMANN, as well as of those of KARSTEN and BONORDEN, is given by EDUARD EIDAM—*Der gegenwärtige Standpunkt der Mycologie mit Rücksicht auf die Lehre von den Infections-Krankheiten*, Berlin, 1871.

§ See particularly the second paper cited in the note *supra*. ‖ *Op. cit.* ¶ See note *supra*.

** The question of the mode of their origin has given rise to a controversy which is still going on. On the one hand, it is held that they arise only when the germs are supplied, and it is contended that these germs are always present in air and water; on the other, it is maintained that whenever the necessary conditions are supplied the forms will originate, even if all the germs present have previously been destroyed and the access of others rendered impossible; in other words, that under favorable conditions spontaneous generation occurs. The literature of this subject is so extensive that I will not even attempt to enumerate the principal works. Among the most important may be mentioned the various essays of POUCHET and PASTEUR who have warmly discussed the subject in France, [see *Comptes rendus de L'Acad. des Sciences*, passim, especially from 1858 to 1869,] and those of BASTIAN and TYNDALL in England. [H. C. BASTIAN—*The Modes of Origin of Lowest Organisms*, London, 1871; *The Beginnings of Life*, London, 1872, and other subsequent papers—is one of the most plausible defenders of the doctrine of spontaneous generation. On the other hand, the experiments of J. TYNDALL—*The optical deportment of the atmosphere in relation to the phenomena of putrefaction and infection*, Phil. Trans., Vol. 166, Part I. 1876, p. 27; *A combat*

appearance in animal tissues undergoing necrosis even while these are still attached to the living body. From such local foci of development it is asserted that they may find their way into the torrent of the circulation, by which they are transported to distant organs, where they lodge, multiply and set up metastatic processes of diverse kinds. Since the first publication of Hallier, the number of those who seek in these vegetable forms the causes of various infectious diseases has continually increased.* It is true that all attempts to indicate distinctions between the form or development-history of the micrococci and bacteria supposed to cause various diseases, or between these and those which occur in ordinary putrefying nitrogenous substances, have hitherto completely failed, but that circumstance has not shaken the faith of those who have adopted this view. Compelled to abandon the morphological basis upon which the hypothesis was at first erected, they have sought a fresh support for it in inoculation experiments;† but as hitherto performed these are far from conclusive; for, although by filtration, diffusion and other devices, it seems to be pretty conclusively shown that the infection resides in solid particles rather than in the fluid in which they float, no methods of separating the vegetable forms from particles of diseased protoplasm‡ derived from the morbid tissues have as yet been devised. The question cannot, however, be regarded as settled, and it is probable that it will continue to be made the subject of experimental inquiry for some time to come.

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*with an infective atmosphere;* Lecture delivered at the Royal Institution, Jan. 19, 1877, British Med. Journ., Jan., 1877, p. 95; and other papers—would seem almost conclusive against this view.] An interesting American paper on the subject is that of Jeffries Wyman, *Observations and Experiments on living Organisms in heated water*, The American Journal of Science and Arts, 2d series, Vol XLIV, (1867,) p. 152.

* The literature, to which the study of the supposed causation of disease by minute vegetable forms has given rise since the first publications of Hallier, is so voluminous that only the most industrious specialist can hope to make a complete survey of it. The best introduction to the study of the subject with which I am acquainted will be found in two series of reviews in *Schmidt's Jahrbücher*; viz., H. E. Richter—*Die neuern Kenntnisse von den krankmachenden Schmarotzerpilzen*, op. cit., Bd. 135, [1867,] S. 81; Bd. 140, [1868,] S. 101; Bd. 151, [1871,] S. 313; Bd. 159, [1873,] S. 169. The author of these reviews was a convert to the doctrines of Hallier, notwithstanding which he gives very fair abstracts of most of the important works on the subject. A less partisan stand-point was maintained in a later series of reviews in the same Journal by F. V. Birch-Hirschfeld; viz., Review of the work of Coze and Feltz, *op. cit.*, Bd. 154, [1872,] S. 236; Review of the work of Ravitsch, *op. cit.*, Bd. 156, [1872,] S. 326; and especially two elaborate reviews, in each of which a number of works are discussed; viz., *Die neuern path.-anat. Untersuchungen über krankmachende Schmarotzerpilze*, op. cit., Bd. 155, [1872,] S. 97, and *Die neueren path.-anat. Untersuchungen über Vorkommen und Bedeutung niederer Pilzformen (Bakterien) bei Infektionskrankheiten*, op. cit., Bd. 166, [1875,] S. 169. The more important American papers on the same subject are the "*Report of Results of Examinations of Fluids of Diseased Cattle with reference to Presence of Cryptogamic Growths,*" by Assistant Surgeons J. S. Billings and E. Curtis, U. S. A., in the Report of the Commissioner of Agriculture, on the Diseases of Cattle in the United States, Washington, Government Printing Office, 1871, p. 156; J. C. Dalton—*The Origin and Propagation of Disease*, New York, 1874; L. A. Stimson—*Bacteria and their influence upon the origin and development of septic complications of wounds*, The New York Medical Journal, Aug., 1875, p. 113; W. H. Van Buren—*On the Poisons which interest the Surgeon*, New York Med. Jour., Nov., 1875, p. 449, and Dec., 1875, p. 561; T. E. Satterthwaite—*Bacteria, their nature, and relation to disease*, The New York Med. Record, Dec. 18, 1875, p. 853; and F. A. P. Barnard—*The Germ theory of disease and its relations to hygiene*, Reports and papers presented at the meetings of the American Public Health Association in the year 1873, p. 70.

† Notwithstanding numerous recent works, the position of the question has not materially changed since the admirable presentation of this phase of the argument by Virchow—*Die Fortschritte der Kriegsheilkunde besonders im Gebiete der Infectionskrankheiten*, Berlin, 1874. I translate two striking paragraphs: "Although we may be unable directly to see these inner differences in such minute bodies as vibrios and bacteria, yet we ought to remember that in the case of the formative cells of the ovule, and of numerous pathological growths, although they appear as gigantic forms alongside of vibrios, we are unable to predict what will grow out of them—yea, eggs themselves are often so similar to each other that the differences of the animals which will proceed from them cannot be suspected in the least degree." "If, therefore, it results from an inoculation or a pathological accident that milzbrand arises from bacteria which are perfectly like those of common putrid infusions, while the bacteria of the common infusions will not develop it, we shall be obliged to conclude that the bacteria of milzbrand are at least as different from the bacteria of the infusion as hemlock from parsley," [p. 33.] In the inoculation experiments which are thought to support this view various devices have been employed to separate the solid particles of the inoculating material from the fluid in which they float; such, for example, as diffusion, practiced first with vaccine matter by A. Chauveau—*Nature du virus-vaccin*, (three notes read to the Academy of Sciences, February, 1868,) Gazette Méd. de Paris, T. 23, [1868,] p. 138; also Archives Gén. de Méd, 1868, T. I, p. 488—and in a somewhat modified way by Burdon-Sanderson, [p. 234 of his first paper, cited *supra*, on page 279;] filtration, especially drawing the virus experimented with through a clay cylinder used as a filter by means of a Bunsen's air-pump, as practiced with material derived from pyæmic abscesses of the lung by Tiegel—*Ueber die fiebererregende Eigenschaft des Microsporon septicum*, Bern, 1871, [see Schmidt's Jahrb., Bd. 155, 1872, S. 103;] and freezing as practiced by E. Bergmann—*Zur Lehre von der putriden Intoxication*, Deutsche Zeitschrift für Chirurgie, Bd. I, [1872,] S. 373. The objection made in the text to the interpretation so often put upon these experiments was, so far as I know, first clearly stated by F. A. Kehrer—*Ueber das putride Gift*, Archiv für Exp. Pathologie u. Pharmakologie, Bd. II, [1874,] S. 33: "It cannot yet be concluded, I think, that because the sepsin cannot be filtered through clay cells and destroyed by boiling, vibrios or other low animal or vegetable forms contain the sepsin in their bodies or develop it by their tissue metamorphosis; for with our present experimental methods it is impossible to separate these organisms from other molecules which are found along with them. It would be better for exact research to indicate openly the limits of our present knowledge, than to fill existing gaps by undemonstrated suppositions, which may perhaps acquire the appearance of truth to those unacquainted with the facts, (den ferner Stehenden.)" [S. 61.]

‡ Lionel S. Beale—*Disease Germs; their supposed nature*, London, 1870; and *Disease Germs; their real nature*, London, 1870—has ingeniously advocated the view that the molecules of diseased protoplasm, or, as he prefers to call it, bioplasm, are the essence of the contagion rather than the associated vegetable forms. According to him, "The minute contagious bioplast is less than the 1-100,000 of an inch in diameter, and often so very clear and structureless as to be scarcely distinguishable from the fluid in which it is suspended." [Second work named above, p. 159.] See also the *Report on the Cattle-plague, to the Royal Commissioners*, London, 1866, by the same author.

Among the diseases whose cause has been sought in the low organisms just described, perhaps none has been more thoroughly studied than the splenic fever of animals, (Milzbrand.) This disease is capable of infecting man, producing ordinarily the so-called malignant pustule, in certain cases of which necrotic hæmorrhagic patches or diphtheritic sloughs are found after death in the mucous membrane of the stomach and intestines; sometimes, also, such patches or sloughs occur when no external lesion has been recognized. In these patches micrococci and bacteria have been found in great abundance, just as we shall hereafter see occurs in the sloughs of diphtheritic dysentery. The morbid condition has hence been designated Mycosis intestinalis. It is usually associated with a brisk catarrh of the mucous membrane of the stomach or intestines, or both, and vomiting and purging often precede the fatal collapse, which, however, occurs also when one or both of these symptoms are wanting, as in fatal cases of the same infection in which the alimentary canal is not affected at all. No cases of this accident were observed during the war; but, as the subject is one of great interest, I subjoin in a footnote an outline of its literature.*

The *odor* of the stools usually becomes strikingly modified after the diarrhœa has lasted a short time. While the passages remain feculent the normal fæcal odor may be retained; but when they become watery or mucous, it is replaced by a peculiar nauseous smell, and in the advanced stages of graver cases, especially in fatal cases for a short time

* The first accounts of Mycosis intestinalis will be found in the papers of E. v. WAHL—*Ueber einen Fall von Mykose des Magens*, Virchow's Archiv, Bd. XXI, 1861, S. 579; F. v. RECKLINGHAUSEN—*Mykose der Magenschleimhaut*, Virchow's Archiv, Bd. XXX, 1864, S. 366; and NICOLAS ZALESKY—*Ein Fall von Sprr im Magen*, Virchow's Archiv, Bd. XXXI, 1864, S. 426; each of whom has described a single case. Then followed the more elaborate papers of LUDWIG BUHL—*Mycosis intestinalis*, Zeitschrift für Biologie, Bd. VI, 1870, S. 129—who reported an additional case, and of WALDEYER—*Mycosis intestinalis*, Virchow's Archiv, Bd. LII, 1871, S. 541—who reported two, and expressed the belief that the disease was really a manifestation of milzbrand. Then followed the brief communication of GREGOR MÜNCH—*Mycosis intestinalis und Milzbrand*, Centralblatt für die medicinischen Wissenschaften, December, 1871, S. 802—who stated that he had made, since 1867, twenty-eight autopsies of persons dead of malignant pustule, in the workmen's hospital at Moscow, with results perfectly corresponding to those of Buhl and Waldeyer; the publication of two cases by A. BURKART—*Ein Fall von Mycosis intestinalis*, Berliner Klinische Wochenschrift, 1873, No. 13, S. 145, and *Ein Fall von Pilzembolie*, op. cit., 1874, No. 13, S. 149; of four cases by E. WAGNER—*Die intestinal Mycose und ihre Beziehung zum Milzbrand*, Archiv für Heilkunde, 1874, Heft 1, S. 1—whose paper contains an excellent discussion of the previous literature of the subject; three cases by W. O. LEUBE and W. MÜLLER—*Drei Fälle von Mycosis intestinalis und deren Zusammenhang mit Milzbrand*, Deutsches Archiv für Klinische Med., Bd. XII, [1874,] S. 517; two by B. FRÄNKEL and J. ORTH—*Zwei Fälle von Milzbrand beim Menschen*, Berliner Klin. Wochenschrift, Nos. 22 and 23, 1874; and one by GERALD YEO—*Mycosis intestinalis*, Dublin Jour. of Med. Sci., September, 1875, p. 253. Some of these cases are no doubt open to the objection raised by VIRCHOW in a note appended to v. WAHL's case, and repeated by v. RECKLINGHAUSEN in his comments on his own case, that the autopsies were made so long after death as to suggest the probability that the fungi found were the mere concomitants of cadaveric putrefaction. But this cannot be urged against all the cases, and when it is considered that the vegetable forms found in milzbrand can in no way be distinguished from those of ordinary putrefaction or of the normal contents of the alimentary canal, it seems probable enough that the forms found in the sloughs of mycosis intestinalis may be derived from the same source as the similar forms, which will hereafter be described, in the dysenteric sloughs; viz., from the bacteria normally present in the intestinal contents, which promptly invade the sloughs so soon as they begin to putrefy, even during the life of the subject. The most popular view at the present time, however is that mycosis intestinalis results from inoculation with virus containing the specific vegetable forms supposed to cause milzbrand, and that the gangrenous patches in the intestine proceed from the localization of these forms. These vegetable forms were first observed by POLLENDER—*Mikroskopische und Mikrochemische Untersuchung des Milzbrandblutes, &c.*, Casper's Vierteljahrsschrift für ger. u. öff. Medicin, Bd. VIII, [1855,] S. 103; and BRAUELL—*Versuche und Untersuchungen betreffend den Milzbrand des Menschen und der Thiere*, Virchow's Archiv, Bd. XI, [1857,] S. 132; and *Weitere Mittheilungen über Milzbrand und Milzbrandblut*, Ib., Bd. XIV, [1858,] S. 432. They were afterwards elaborately studied by DAVAINE—*Recherches sur les infusoires du sang dans la maladie connue sous le nom de sang de rate*, Comptes rendus de l'Acad. des Sciences, T. LVII, [1863,] pp. 220; 351 and 386, and T. LIX, [1864,] p. 393—and quite recently under the supervision of COHN by KOCH—*Die Aetiologie der Milzbrand-krankheit, begründet auf die Entwicklungsgeschichte des Bacillus Anthracis*, Cohn's Beiträge zur Biologie der Pflanzen, Bd. II, Heft 2, Breslau, 1876, S. 277, with plate. POLLENDER described these forms as presenting the closest resemblance to "vibrio bacillus" or "vibrio ambiguus;" DAVAINE called them "bactéridia," KOCH, who names them "bacillus anthracis," gives no characteristics adequate to distinguish them from the bacillus subtilis of COHN (which are found in ordinary butyric acid fermentation, &c.) except the fact that they occur in milzbrand. The reader who desires to become acquainted with the general subject of milzbrand is referred particularly to the following works: C. F. HEUSINGER—*Die Milzbrandkrankheiten der Thiere und des Menschen*, Erlangen, 1850; R. VIRCHOW—*Die Carbunkelkrankheit beim Menschen*. Handb. der spec. Path. u. Ther., Bd. II, Abth. 1, Erlangen, 1855, S. 394; L. A. RAIMBERT—Art. *Charbon*, in the Nouv. Dict. de Méd. et de Chir. Prat., T. VII, Paris, 1867, p. 179; KORÁNYI—*Der Milzbrand*. Handb. der allg. u. spec. Chir. v. Pitha u. Billroth, Bd. I, Abth. 2, Erlangen, 1870, S. 149; O. BOLLINGER—*Beiträge zur vergleichenden Path. u. Path. Anat. der Hausthiere*. Heft 2, Munich, 1872; also the article *Milzbrand* by the same author, in ZIEMSSEN's Handb., Bd. III, Leipzig, 1874, S. 447, (Amer. Transl., Vol. III New York, 1875, p. 373.) It will be learned from the earlier of these works that long before mycosis intestinalis was recognized, hæmorrhagic, gangrenous or diphtheritic patches were occasionally observed in the mucous membrane of the stomach and intestines of human subjects dead of milzbrand. Among those who are liable to this affection, workers in hair may be particularly mentioned. I subjoin the titles of papers describing two outbreaks of "malignant pustule," so-called, among hair-workers, in which the intestinal lesions alluded to were observed in some of the autopsies, but not identified as mycosis intestinalis: J. NEYDING—*Beitrag zur path. Anat. der Pustula maligna beim Menschen*, Casper's Vierteljahrsschrift f. ger. u. öff. Medicin, Bd. X, N. F., [1869,] S. 241—describes the occurrence of a number of cases among workers in hair and bristles in Moscow; five autopsies were made, and the gastro-intestinal lesions were recognized in four of them; SILAS E. STONE—*Cases of malignant pustule*, Boston Med. and Surg. Jour., Vol. I. N. S., [1868,] p. 19, and *Malignant vesicle*, Ib., Vol. III. N. S., [1869,] p. 21—reports 13 cases occurring among the persons working in or connected with, a hair factory near Walpole, Mass. MORRILL WYMAN, in an autopsy on one of these cases, observed "ecchymosed patches" in the intestinal mucous membrane. Bacteria were observed in the blood of some of these patients by JEFFRIES WYMAN and HODGES. See Boston Med. and Surg. Jour., Vol. II, N. S., [1869,] p. 359.

before death, the odor becomes very offensive, approximating that of putrefying organic matter, and well deserving the epithet cadaverous, which has frequently been applied to it. Even when the odor of the dejecta is not at all offensive immediately after they are voided, it will usually be observed that putrefaction occurs much earlier than it does in the normal fæces, and that if the stools are kept for the inspection of the medical attendant they are apt to be found by him in a much more offensive condition than when they were first passed.

This circumstance has been commented on by Dr. T. Inman, of Liverpool,* who explains it by supposing the absence of the putrefactive odor in the case of the normal fæces to be due to the possession by the excreta of "a certain vital power" which enables them to resist the tendency to decomposition, and which being diminished in disease permits putrefaction to occur. In this explanation the doctrine of vital force is pushed to an extreme which may well provoke a smile, and certainly it would seem that a much simpler explanation may serve to account for the phenomena. That the normal fæces do not putrefy in the large intestine before they are voided is due partly to the almost total absence of oxygen from the gases of both small and large intestine under normal conditions,† and partly to the presence of certain substances which appear to exert an antiseptic influence, among which one of the most important is, perhaps, the bile.‡ It has been shown by several experimenters that when a biliary fistula is established in a dog, and the bile thus prevented from entering the intestinal canal, putrid decomposition of the alimentary substances takes place, giving an offensive odor to the fæces and flatus, at least so long as the

* T. INMAN—*On the Influence of Vitality upon the Excretions.* The British Medical Journal, April 30, 1859, p. 350, June 11, 1859, p. 461, and July 2, 1859, p. 523.—"The fæces, retained though they be sometimes for days, and in some rare cases for weeks and months, in the colon or the rectum, do not decompose there, as they do when they are expelled from the body; and this observation holds good, even though the bowels are distended with flatus, and the fæcal matter is in contact with a gas differing in no degree from common atmospheric air." "We account for this by saying that the excreta have a certain vital power as long as they remain in the body, which enables them to resist the ordinary laws governing the inorganic world. But we know from experience that the vital power does not immediately leave a limb after it has been amputated; and it becomes, therefore, a question whether vitality may not also remain in excretions for some time after their expulsion from the body," p. 461. Dr. Inman then points out that in healthy infants the motions retain their peculiar odor "for twelve hours at least;" but that, if "the child loses its healthy condition, the motions not only change in color and consistence, but in smell, and decompose in a very short time after being passed. Where there is diarrhœa and excessive depression of the vital powers, the motions are often found to be decomposed in a few minutes." He shows that this observation holds good also in the case of adults laboring under diarrhœa, and that "decomposition takes place in the alvine secretions very rapidly in fevers and all diseases marked by great debility." In the same diseases the urine decomposes more rapidly than the urine of healthy persons. Dr. Inman argues that the speedy decomposition in all these cases is due to the excreta of debilitated individuals being endowed with less than the normal amount of vitality, and concludes that "If the physician finds that the excretions of any of his patients decompose more rapidly than they would do during health, (under the same external circumstances of light, air and heat,) he may feel certain that the vital powers are seriously impaired," p. 462. With this conclusion we may at least agree so far as to admit that speedy decomposition occurs only when the quality of the excreta is abnormal.

† See F. A. LONGET—*Traité de Physiologie*, 2me edit., Paris, 1861, Tome I, p. 282; WM. B. CARPENTER—*Principles of Human Physiology*, 7th edit., London, 1869, p. 150; AUSTIN FLINT, Jr.—*The Physiology of Man: Alimentation, &c.*, New York, 1867, p. 411—and other recent text-books of physiology.

‡ WILLIAM SAUNDERS—*A treatise on the Structure, Economy and Diseases of the Liver, &c.*, 2d edit., London, 1795—appears to have been the first to have suggested this use of the bile: "It seems very probable, that from its resinous bitter, it may counteract any active and spontaneous changes to which animal and vegetable matter would otherwise be subject." p. 127. "It likewise, from its bitterness, possesses antiseptic powers, which are peculiarly useful in the intestinal canal." p. 130. TIEDEMANN and GMELIN—*Recherches Experimentales, Physiologiques et Chimiques, sur la Digestion*, Traduites de l'Allemand par A. J. L. Jourdan, Paris, 1826, 2de Partie, pp. 48 and 71—found that when the common bile-duct was tied in dogs the stools became putrid, and a comparatively large quantity of offensive gas was developed in the alimentary canal. They also pointed out that in the human subject jaundice is accompanied by fetid dejecta, and the development of a large quantity of intestinal gases smelling of sulphuretted hydrogen. HERMANN HOFFMANN—*Zur Verdauungslehre*, Hæser's Archiv, Bd. VI, (1844,) S. 177—quotes the views of these authors with approval, and treats at some length of the antiseptic influence of the bile. BIDDER and SCHMIDT—*Die Verdauungssäfte und der Stoffwechsel*, Mitau and Leipzig, 1852, p. 218—in the case of dogs in which they had established biliary fistulæ, observed similar conditions to those noted by TIEDEMANN and GMELIN after ligation of the bile-duct. Not merely did the fæces of such dogs possess an almost carrion-like odor, but the dogs were troubled with continual borborygmus and the escape of very offensive flatus. These conditions, however, were only observed when the dogs were fed on animal food, and were most marked when they were fed on flesh alone. When the same dogs were fed on bread only, they were troubled quite as much by wind, but both the flatus and the fæces were nearly odorless, and the latter were even more strongly acid than in dogs without biliary fistulæ when fed on the same diet. TH. SCHWANN—*Expériences pour constater si la bile joue dans l'économie animale un rôle essentiel pour la vie*, Nouveaux Mémoires de l'Academie Royale des Sciences et Belles-lettres de Bruxelles, Tome XVIII, (1845,)—who was the first to establish biliary fistulæ in dogs, does not mention whether the stools of the animals on which he operated became fetid or not; while N. BLONDLOT—*Essai sur les Fonctions du Foie et de ses Annexes*, Paris, 1846—succeeded in establishing a biliary fistula in a bitch, whose fæces after the operation, he declares, were neither more nor less odorous than those of healthy dogs; and on this account he denies the antiseptic action of the bile, (p. 71.) It appears, however, from a subsequent paper by the same author—*Inutilité de la Bile dans la Digestion proprement dite*, Paris, 1851—that this bitch lived in good health for five years after the operation with the fistula still open, whence AUSTIN FLINT, Jr.—*The Physiology of Man: Alimentation, &c.*, New York, 1867, p. 362—argues with great plausibility that BLONDLOT's experiment must have been incomplete, and that, in spite of the operation, a communication must have continued to exist between the bile-duct and the duodenum through which a portion of the bile must have found its way into the intestine. Dr. FLINT himself found the stools of a dog in which he successfully established a biliary fistula extremely offensive. (*Op. cit.*, p. 369.)

animal is fed partly or entirely on flesh. According to Bidder and Schmidt, if such dogs are fed exclusively on bread the putrid decomposition does not take place, but the stools are preternaturally acid; and it is stated by Longet* that the lactic acid developed in the alimentary canal during the decomposition of vegetable food exercises an antiseptic action similar to that of the bile. After the fæces are voided the antiseptic influence of these substances continues to act, and this is no doubt the reason that decomposition does not occur more rapidly than it does.

That the fluid stools of diarrhœa putrefy as rapidly as they do is owing in part to the fact that they contain a much greater proportion of water than the normal fæces, which is of course favorable to the occurrence of speedy decomposition; in part it is due, in many cases at least, to the circumstance that the bile is diminished in quantity, as indicated by the pale color of the dejecta, and that its antiseptic influence is proportionately diminished. These two factors appear to be sufficient to account for the phenomena in most cases. It is indeed probable enough that the morbid secretions of the inflamed mucous membrane of the intestine may contain organic matters in a more unstable state of equilibrium, and therefore more prone to decompose than the normal intestinal juices, but if this should be shown to be true, it would rather afford a simple chemical explanation of the speedy decomposition than favor the supposition of Dr. Inman.

Putrid stools much more frequently attracted attention in dysentery than in acute diarrhœa, and in that case yet another factor, namely, the necrosis of the diphtheritic sloughs, often enters into the question of causation, as will be shown hereafter.

The stools vary as much in their *frequency* as in other particulars. There may be but two or three loose passages daily, or the number may be as great as twenty, fifty, or even a hundred, or more, in the twenty-four hours. The *quantity* of the dejecta is also very variable, and stands in no direct relationship to the frequency of the motions. It is almost always greater than the normal quantity, which may be estimated as, on an average, about five ounces.† According to Dalmas the liquid stools may amount, in extreme cases, to as much as forty pounds in the twenty-four hours.‡ It has been shown by Ihring§ that this increase in quantity is not due merely to an increase in the quantity of water contained in the stools, but that the absolute amount of solids excreted is also increased.

*Occurrence of similar cases in groups.*—A noteworthy fact, observed during the Civil War, which deserves remark in this place, was the tendency of the cases of acute diarrhœa, occurring in any particular command at a given time, to present a number of phenomena in common, resembling each other both in the grade of the attack, the constitutional condition of the patients, and the concomitant complications. Nor is this circumstance surprising, since large bodies of men were exposed simultaneously to similar morbific influences. Various grades of the disorder thus became epidemic, from simple looseness without pain, to the severest inflammatory forms, with divers coexisting constitutional disturbances, especially those resulting from the malarial influence, the scorbutic taint, or both.

As an example of the milder epidemics, I may refer to those outbreaks which so frequently occurred, especially during the first year of the war, immediately after bodies

* *Traité de Physiologie*, Tome I, Paris, 1861, p. 250.

† According to WEISARG, 4.6 ounces; according to HAMMOND, 5.24. See AUSTIN FLINT, Jr. *The Physiology of Man: Alimentation, &c.*, New York, 1867, p. 305. LEHMANN estimates the quantity at 120 to 180 grammes—*Physiological Chemistry*, translated by G. E. Day, London, 1853, Vol. II, p. 141. CARPENTER puts it at from 2 to 10 ounces—*Principles of Human Physiology*, London, 1869, p. 149. SMITH and MILNER found the average weight of the fæces in the case of prisoners at Coldbath Fields Prison, condemned to treadwheel labor, and fed on a full diet with brown bread, to be 8.55 ounces, which they estimate as "double of that found in ordinary life."—*Year-Book of the New Sydenham Society* for 1861, p. 83.

‡ *Dict. de Méd.*, 2me édit, Tome X, Paris, 1835, p. 271. § Thesis cited on page 278, *supra*.

of recruits were first assembled in camps and barracks.* Regiments encamped in tents in healthy localities appear to have suffered, as well as those in which the men were huddled together in ill-ventilated temporary quarters in cities and towns, or crowded into wooden barracks left filthy by their former occupants. The extreme frequency of such outbreaks is indicated by the fact that the ratio of the cases of acute diarrhœa to strength among the white troops was larger during the summer of 1861, at the very commencement of the war, than at any subsequent period, and the mild character of the disease is shown by the proportionately small mortality during the same period. Among the colored troops in the Atlantic region the same circumstance is noticeable during the first summer represented by the reports. In the Central region, however, the diarrhœa which prevailed among the new levies of colored troops was, in consequence of the circumstances alluded to on page 8, of a much more fatal character.

In these initial epidemics the type of the disease most frequently observed was a simple painless flux, with copious, often watery passages, and accompanied by comparatively little constitutional disturbance. The great majority of such cases recovered in a few days. A certain proportion of severer cases often occurred, however, and mild dysenteric attacks frequently coexisted.

Sometimes a newly levied regiment escaped until after it left its native State and went into its first encampment at or near the seat of war; and, under the same circumstances, second outbreaks were common enough among regiments which had already suffered before leaving home. Such outbreaks also were usually mild, the great majority of the patients speedily recovering.

At a later period in the war, after the troops had been long exposed to the deleterious influences of camp life, the cases of diarrhœa assumed a more serious character, were apt to pursue a more protracted course, and exhibited a greater tendency to pass into the chronic form.

*Coexistence of other diseases with diarrhœa.*—Moreover, the character of the diarrhœa which prevailed in a command at any given time was very often more or less modified by the simultaneous prevalence of certain other affections, especially of dysentery, cholera morbus, intermittent and continued fevers, and scurvy, or its milder manifestation the scorbutic taint. The operation of the causes which produce these affections at the same time with those which produce diarrhœa not merely led to the occurrence of cases of the several disorders named, some of which affected those who were already laboring under diarrhœa, but often modified, more or less profoundly, the constitutional condition of even those diarrhœal patients who escaped the actual development of the second disease. A few words may here be said with regard to those affections whose coexistence with diarrhœa

* In addition to the few references to this subject in the reports in Section II, I note two interesting communications in the Boston Medical and Surgical Journal, Vol. LXV, 1861, pp. 294 and 316—the first by Surgeon GEORGE A. OTIS, 27th Massachusetts volunteers, (subsequently Assistant Surgeon U. S. A., and editor of the Surgical Volumes of this work,) who comments on the prevalence of diarrhœa in his regiment, then just assembled in camp at Springfield, Massachusetts, and expresses the opinion that those of the men who were unprovided with flannel under-garments were most liable to the disease: "In company F, Westfield, 100 strong, scarcely a man escaped. I attributed this to the delay in mustering in this company, and procuring suitable under-garments from the quartermaster." The second communication is by Surgeon JAMES BRYAN, Cameron dragoons, who, writing from the Army of the Potomac, November 6, 1861, gives a brief description of a form of diarrhœa which was common enough among the recently enlisted troops: "This disease, as has been already stated, is generally preceded by several days' constipation of the bowels, and in the recently enlisted volunteer is usually of a mild character. Pain in the region of the stomach and umbilicus gradually extends down to the colon and rectum. The discharges, at first more or less solid, become afterwards fluid, mucoid, watery or bilious, accompanied not unfrequently with considerable tenesmus. The abdominal pains cease with the occurrence of tenesmus, and this again terminates perhaps at the end of two or three days from the onset of the disease. The patient is thus restored to health without medical interference, for the time being." See, also, on the same subject, JOHN C. DRAPER, *Medical Experience at Harper's Ferry during a three months' campaign*—The American Medical Times, Vol. V, 1862, p. 325, and a letter from Ship Island, Mississippi, by Surgeon J. H. THOMPSON, 12th Maine volunteers, in the Boston Medical and Surgical Journal, Vol. LXVI, 1862, p. 338: "On the second day after our debarkation, twenty-four privates and officers were attacked with diarrhœa and dysentery, and so rapidly the epidemic diffused itself that nearly every man in the command was affected with it during the following three weeks."

most frequently attracted attention. Of these the most intimately allied to diarrhœa is *dysentery*. A certain proportion of cases of dysentery always occurred whenever acute diarrhœa was present. Not only is this circumstance referred to in many of the reports in Section II,* but, as will be shown hereafter, the ratio of cases of acute dysentery reported increased and diminished, as a rule, with the ratio of cases of acute diarrhœa, though not always in exactly the same proportion. A portion of these cases of acute dysentery occurred *de novo* in subjects who had previously enjoyed good health, but very often the dysenteric attacks supervened upon acute diarrhœas which had resisted treatment, or selected as victims those who were already suffering from a chronic flux. This circumstance will be again referred to in the course of the remarks on dysentery; at present, however, it may be suggested, that when it is remembered that the colon is usually involved in acute diarrhœa, it will readily be understood that a very slight extension of the inflammation downwards will involve the rectum and bring on dysenteric symptoms. This appears to take place quite frequently in the more severe cases, so that in fact simple inflammatory dysentery seems to differ from inflammatory diarrhœa chiefly in the intensity of the morbid process, both diseases occurring under similar circumstances and apparently under the influence of identical causes. As to the more dangerous diphtheritic form of dysentery, though the relationship is not so clear, there can be no doubt that it is more apt to occur in those whose intestinal mucous membrane is already the seat of a simple inflammatory process than in perfectly healthy individuals.

It has already been mentioned that nausea and vomiting frequently occur as symptoms of acute diarrhœa. Sudden attacks of simultaneous vomiting and purging, due often to mere irritation of the gastro-intestinal mucous membrane, sometimes, however, to inflammation of various grades, were very generally reported under the head of *cholera morbus*. The number of cases ascribed to this disease was 25,215 among the white troops, with 275 deaths, and 1,151 among the colored troops, with 30 deaths.† These were reported at all seasons of the year, but were most numerous from May to October; there does not, however, appear to be any very close connection between the fluctuations in their monthly ratios and those of diarrhœa or dysentery.

The simultaneous prevalence of diarrhœa with *intermittent* and *remittent fevers* is alluded to in a number of the reports,‡ and the monthly ratios of these fevers, to be presented hereafter, will indicate considerable similarity between their general distribution and that of diarrhœa, both as regards season and region. It was also exceedingly common for intermittent or remittent fever to coexist with diarrhœa in the same individual, the fever sometimes preceding and sometimes following the initiation of the bowel affection. Moreover, diarrhœa was of very frequent occurrence among those who gave evidence of chronic malarial poisoning by their yellowish, pallid countenances, more or less pronounced emaciation, and enlarged spleens.

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*On the association of diarrhœa with dysentery, note in Section II the remarks of VAN SLYCK, p. 66, STORROW, BRADLEY and CHAMBERLAIN, p. 67, CALHOUN, p. 73, MCKELWAY, p. 75, BROWN, p. 77, WAINWRIGHT and MINIS, p. 78, GALL and WILSON, p. 79, MULFORD and SCHEETZ, p. 80, HARRISON and FORBES, p. 82, BIGELOW, p. 83, VEETER, p. 84, REYNOLDS, JONES and MCCLURE, p. 85, GRANGER and GRIMES, p. 86, SPRAGUE and CLEVELAND, p. 87, ETHERIDGE, p. 89, FRICKER, FOOTE, TOMPKINS and MCMILLEN, p. 90, COOPER, WALTON and GAGE, p. 93, BENEDICT, p. 98, BATES and BACHE, p. 99.

†See the First Medical Volume, Tables C and CXI.

‡On the association of diarrhœa with intermittent and remittent fevers, note in Section II the remarks of LITTLE, p. 68, PEASE and BELLOWS, p. 69, WHITTINGHAM, p. 70, WOOD, p. 74, MCKELWAY, p. 75, MORRISON, p. 77, WILSON, p. 79, HARRISON, p. 82, LUCAS, p. 83, VEETER and REYNOLDS, p. 84, SCOTT, p. 85, SKEER and BOGUE, p. 87, YORK, p. 88, FINLEY, p. 89, PYLE, HOFF and BLADES, p. 91, DE PERRY, MORSE and PHILLIPS, p. 92, COOK, p. 93, BIDWELL, p. 95, BRYAN, p. 96, BATES, p. 99, and BRADT, p. 100. Note also the remarks of T. H. WALKER—*Camp Diarrhœa*, in the Chicago Medical Journal, Vol. XIX, (1862,) p. 478—on the frequency with which diarrhœa was complicated with intermittent fever in the army before Corinth, Mississippi.

The coexistence of diarrhœa with *continued fevers* also attracted attention.* It is well known that in ordinary typhoid fever diarrhœa is a prominent symptom, and it will be shown in a subsequent chapter that it frequently occurred also as a complication of a form of continued fever which differed from typhoid fever in the absence of the characteristic lesion of the patches of Peyer as well as in other particulars. Of course, therefore, it will be understood that patients were often supposed at first to be ill with simple diarrhœa who ultimately proved to be in fact suffering from some form of continued fever; but it is also true that continued fevers and diarrhœas frequently prevailed together, affecting different individuals in the same command.

The coexistence of diarrhœa with openly pronounced *scurvy* was not very common, since the latter affection fortunately proved comparatively rare. A recognizable, but usually mild, *scorbutic taint* was of more frequent occurrence, and whenever this made its appearance diarrhœa became prevalent, and showed an increased tendency to pass into dysentery and to become chronic. It not unfrequently happened that the scorbutic taint coexisted with chronic malarial poisoning, and that numerous cases of diarrhœa, dysentery, ague and continued fever occurred simultaneously in the same command. Under such circumstances all the patients usually presented many symptoms in common and it was not always easy to make an accurate diagnosis.†

The occasional coexistence of diarrhœa with *inflammatory affections of the respiratory organs* is also alluded to in several of the reports,‡ and deserves some mention in this place. It was noticed, especially after the occurrence of epidemic measles, and after exposure to cold and inclement weather, particularly after marches during which the troops were insufficiently sheltered at night. Under such circumstances numerous cases of diarrhœa and dysentery occurred along with cases of bronchitis or even of pneumonia. For example, during the siege of Fort Donelson in February, 1862, the besiegers were exposed without shelter, and even without fires at night, to a light fall of snow degenerating into sleet; as a consequence, "diarrhœa, dysentery and pneumonia of a typhoid type became fearfully prevalent."§

Under such circumstances the chest and bowel affections sometimes coexisted in the same individuals; but perhaps it more frequently happened, that while some suffered only from the former, in others the latter was the sole complaint. The development of the one disease or of the other, under such circumstances, was probably very often dependent upon the previous history of the patient; those who had already frequently suffered from diarrhœa being most apt to be attacked by bowel affections after such exposure, while those who had previously been troubled with coughs and colds were most apt to contract chest affections.

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* On the association of diarrhœa with continued fevers, note in Section II the remarks of MARSH, p. 68, STUART, p. 69, PERRY, p. 70, WOOD, p. 74, MCKELWAY, p. 75, BLAKESLEE, p. 76, CADY, p. 77, FORBES, p. 82, WALTON, p. 88, MILLER, p. 89, and ANGELL, p. 97.

† Note, for example, as affording a lively picture of this difficulty, the remarks of Surgeon ALONZO J. PHELPS, U. S. V.—*Observations in the Field, near Corinth, Mississippi*, American Medical Monthly, Vol. XVIII, August, 1862, p. 94.—Speaking of one of the hospitals left when the western armies advanced after the evacuation of Corinth, he says: "In this hospital alone, there were registered seventeen hundred patients. All of these cases presented the same type of disease, but variously expressed under the terms of Febris Typhoides, Diarrhœa, Dysentery, Scorbutus and Debilitas. Subsequent observation demonstrated the artificial character of this classification, and that the disease acquired its name from the most prominent symptoms present, and not in accordance with reliable pathological conditions. It could not easily have been otherwise, as all surgeons will testify who have found upon their register in the course of a few weeks the same person under treatment for dysentery, diarrhœa and febris typhoides; the same attack acquiring a new name, in accordance with the development of new symptoms, or the absence of others. In fact, there has been so great a variety in the manifestation of these diseases, seldom ever running a regular course, but alternating one with the other, and exhibiting so many symptoms in common, that the nomenclature could not have been otherwise than very confused."

‡ See, for example, in Section II, the remarks of BELLOWS, p. 69, LEE, p. 71, TIBBALS and WOOD, p. 74, HOYT, p. 80, HOOD, p. 83, and MILLER, p. 89.

§ See the report of Surgeon JOHN H. BRINTON, U. S. V.—Appendix to Part I, p. 23. See also, in the same Appendix, the remarks of W. B. DE WITT, Jr., p. 213, HATCHITT, p. 259, and COOPER, p. 325, as furnishing other examples.

PROGRESS AND TERMINATION.—It has been shown in the first section of this chapter that the number of deaths attributed to this cause was but one to every three hundred and ninety-five cases among the white troops, and one to eighty-three cases among the colored troops. The danger of the disease did not, then, consist in the immediate probability of a fatal issue, but in its proneness to pass into dysentery or to become chronic, and in the fact that even when it apparently terminated in complete recovery the soldier was usually left peculiarly liable to subsequent attacks.

The majority of cases terminated in recovery in the course of a few days; but often, even when the diarrhœa was mild, comparatively painless, and unaccompanied by fever, it was of longer duration, sometimes persisting, in spite of treatment, for weeks together with variable results. Painless diarrhœas were often neglected by the patients for some time, and it was not uncommon for soldiers to present themselves at sick-call for the treatment of a flux which, on inquiry, they confessed had already lasted several weeks. Such cases were apt, sooner or later, to assume a graver character; not unfrequently fever set in more or less abruptly, the stools became more frequent and painful, and a certain degree of abdominal tenderness was developed; in some instances the diarrhœa passed into dysentery; in others it passed gradually into some form of chronic flux.

Those cases which, from the very first, were accompanied by marked fever and more or less abdominal tenderness, very often lasted ten days or two weeks before convalescence set in; occasionally, especially in the fatal cases, they were still more protracted, three or four weeks, or even longer, sometimes elapsing between the inception of the disease and the fatal issue. Both in these cases and in those in which the febrile reaction was not developed until the diarrhœa had already lasted some days, the fever was sometimes distinctly remittent in its character, assuming the quotidian or tertian type, and presenting a train of symptoms not unlike those of malarial remittent fever. This resemblance was occasionally still further increased by the appearance of an icteroid hue of countenance, or of decided jaundice, a complication which occurred most frequently in those cases in which there was much nausea and vomiting. Such cases were doubtless, in part at least, actual remittent fevers accompanied by catarrhal inflammation of the intestinal mucous membrane, and readily explained by the circumstance that the causes of the two diseases acted simultaneously upon the same individuals. In yet other cases the fever was of a continued type, and this circumstance, taken in connection with the tympanites and tenderness in the right iliac region which at times accompanied the diarrhœa, produced in some instances a misleading resemblance to ordinary typhoid fever. In all these febrile cases the fever was usually of an adynamic character from the very first, and the rapidity with which the patients became emaciated was a noteworthy circumstance.

In fatal cases the pulse became progressively more frequent and feeble; the tongue, which at first had been furred and moist, became red and dry; the abdomen greatly distended with flatus; the stools more frequent, often acquired a very offensive odor, finally were passed involuntarily, and the patient gradually sank. Sometimes delirium set in toward the close, or the patient passed into a state of stupor and died comatose; more frequently the mind remained clear almost to the very last. In other cases some intrathoracic inflammation, especially a low form of pneumonia, was developed a few days before death, and was the immediate cause of the fatal issue. In others, marked symptoms of local, or even of general peritonitis, were recognized before death.

In the more favorable cases the fever gradually subsided, the pulse became slower and stronger, the stools diminished in frequency, acquired a more natural character, and the appetite and strength gradually returned. Very often, however, several months elapsed before the patient was fully restored to health. Moreover, in a considerable number of instances, after the subsidence of the fever the diarrhœa continued with more or less severity, either continuously or at intervals, and finally assumed the characters of the chronic forms of flux. This was the history of many of the cases of diarrhœa which occurred in the Army of the Potomac during the summer of 1862. The designation Chickahominy diarrhœa, derived from the stream along whose swampy banks the Army of the Potomac was encamped during the latter part of May and the month of June, was very generally bestowed upon all the cases of flux sent to General Hospital from that army during this period and the subsequent encampment at Harrison's Landing. As thus used the term embraced several forms of diarrhœa and dysentery, all of which, however, occurred also in other armies and at various periods of the war.

Influence of Season and Region.—The number of cases of acute diarrhœa, and the mortality attributed to this disease in the reports, were discussed in the first section of this chapter; but, in addition to what was then said, I have deemed it advisable to add in this place a table showing the monthly ratio to strength of the cases reported in each region under this head.

*Number of cases taken on sick report each month with Acute Diarrhœa among the White troops, expressed in ratio per* 1,000 *of mean strength.*

*Atlantic Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1862.. | 147 | 99 | 58 | 51 | 37 | 22 | 18 | 16 | 27 | 47 | 48 | 61 | 487 |
| Year ending June 30, 1863.. | 104 | 67 | 84 | 85 | 55 | 45 | 41 | 32 | 28 | 23 | 45 | 45 | 613 |
| Year ending June 30, 1864.. | 52 | 75 | 68 | 44 | 30 | 29 | 21 | 14 | 14 | 22 | 42 | 76 | 485 |
| Year ending June 30, 1865.. | 93 | 86 | 62 | 48 | 37 | 30 | 28 | 20 | 22 | 31 | 45 | 52 | 531 |
| Year ending June 30, 1866.. | 40 | 33 | 28 | 23 | 21 | 17 | 11 | 11 | 13 | 14 | 21 | 42 | 336 |

*Central Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1862.. | 76 | 114 | 73 | 61 | 52 | 47 | 60 | 43 | 53 | 82 | 76 | 72 | 792 |
| Year ending June 30, 1863.. | 55 | 47 | 60 | 56 | 45 | 43 | 62 | 51 | 57 | 52 | 51 | 61 | 642 |
| Year ending June 30, 1864.. | 55 | 57 | 40 | 37 | 29 | 25 | 22 | 18 | 22 | 27 | 47 | 68 | 444 |
| Year ending June 30, 1865.. | 64 | 60 | 46 | 37 | 31 | 35 | 30 | 23 | 33 | 34 | 39 | 45 | 480 |
| Year ending June 30, 1866.. | 44 | 37 | 35 | 29 | 21 | 17 | 21 | 19 | 18 | 21 | 36 | 53 | 404 |

*Pacific Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1862.. | 21 | 32 | 23 | 24 | 22 | 9 | 10 | 14 | 13 | 12 | 18 | 17 | 205 |
| Year ending June 30, 1863.. | 21 | 33 | 26 | 20 | 20 | 13 | 9 | 6 | 9 | 15 | 13 | 17 | 201 |
| Year ending June 30, 1864.. | 23 | 20 | 19 | 15 | 12 | 8 | 8 | 5 | 8 | 7 | 8 | 11 | 138 |
| Year ending June 30, 1865.. | 20 | 27 | 27 | 22 | 14 | 8 | 10 | 7 | 7 | 8 | 15 | 19 | 185 |
| Year ending June 30, 1866.. | 21 | 20 | 20 | 22 | 13 | 16 | 11 | 7 | 9 | 14 | 20 | 19 | 191 |

*Number of cases taken on sick report each month with Acute Diarrhœa among the Colored troops, expressed in ratio per* 1,000 *of mean strength.*

*Atlantic Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1864.. | 69 | 194 | 160 | 84 | 57 | 32 | 22 | 21 | 32 | 30 | 76 | 87 | 682 |
| Year ending June 30, 1865.. | 120 | 119 | 72 | 50 | 36 | 38 | 66 | 33 | 40 | 42 | 76 | 68 | 723 |
| Year ending June 30, 1866.. | 50 | 35 | 24 | 14 | 17 | 11 | 18 | 16 | 19 | 24 | 15 | 19 | 322 |

*Central Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1864.. | 87 | 78 | 61 | 60 | 57 | 43 | 41 | 46 | 65 | 76 | 91 | 106 | 821 |
| Year ending June 30, 1865.. | 77 | 75 | 56 | 40 | 39 | 40 | 38 | 30 | 42 | 44 | 62 | 70 | 617 |
| Year ending June 30, 1866.. | 67 | 49 | 45 | 43 | 28 | 30 | 25 | 22 | 19 | 21 | 21 | 28 | 467 |

The ratios in the foregoing tables, like those of the tables representing the number of cases of diarrhœa and dysentery given in Section I,* are deduced from the number reported as taken on sick report monthly; and, therefore, do not represent the whole number sick with diarrhœa, but simply the new cases. The ratios for the several years are not the sums of the monthly ratios, but are directly computed from the annual mean strength and the total number of cases. A series of curves constructed from the ratios given in these tables would be found to be very nearly parallel to those of the diagrams in Section I, which represent the total number of acute and chronic cases of both diarrhœa and dysentery. The parallelism exists in the case of the colored troops as well as the white, and in all three regions, though, as might be expected, it is least exact in the Pacific Region, where the number of cases is the smallest.

* Pages 19 and 23 *supra.*

Post mortem Appearances in Acute Diarrhœa.—A large proportion of the deaths from acute diarrhœa occurred in the field,* where there were no facilities for making post mortem examinations, and hence the number of autopsies reported in cases which terminated fatally in the early stages is not so large as could be wished, even if we include intercurrent diarrhœas, which set in shortly before the fatal issue, in patients dying of other diseases. A much larger number of autopsies was reported in cases which had lasted from three or four weeks to two months, or even longer, both because cases of this class were so much more numerous, and because they so much more frequently found their way to the general hospitals, where the opportunities for making autopsies were comparatively good. These more protracted cases pass by insensible degrees into those which may properly be called chronic, and it is difficult to draw a boundary line between the two groups. For this reason I have thought it advisable to present in this place all that I shall have to say with regard to the anatomical details of hyperæmia of the intestinal mucous membrane, and those cases of inflammation which do not progress so far as to develop intestinal ulcers, reserving all consideration of the ulcerative process until I come to consider the chronic forms of intestinal fluxes.†

It must, however, be distinctly understood that this arrangement is only made to avoid needless repetitions; for the rapidity with which ulcers are developed varies with the intensity of the disease, so that on the one hand they may be encountered in patients who have been ill but a short time,‡ while on the other hand it is not uncommon to meet fatal cases in which no intestinal ulcers exist, although the flux has been protracted for from five or six months to a year, or even longer.

It is further to be remarked that the lesions about to be described differ in no essential

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* Viz: 1,407, or nearly one-half the number of deaths reported under this head.

† Although it was well known to the ancients that a protracted diarrhœa might give rise to inflammation, and ultimately to ulceration of the intestines, (*i. e.*, pass into dysentery,) yet this flux was rather regarded as a merely functional disturbance, and a knowledge of the fact that some degree of simple inflammation of the intestinal mucous membrane is usually present in diarrhœa is of comparatively recent date. According to Craigie [p. 688, *op. cit.*, *infra*] "distinct traces of the opinion, that intestinal inflammation gives rise to diarrhœa," may be found in the Reports of Ludovic Bang—*Selecta diarii nosocomii regii Fridericiani Hafniensis*, Hafuiæ, 1789—but I understand that physician to speak of it rather as an occasional than as a usual cause. Thus, in November, 1782, (T. I, p. 47,) he records a case of diarrhœa in which intestinal inflammation being suspected, (aliqualem inflammatoriam statum intestinis inhærere suspicans,) blood was let three times, and the patient cured. In August, 1786, (T. II, p. 233,) having opened the body of a subject in whom a painful diarrhœa had been followed by peritoneal effusion, for which paracentesis had been employed with only temporary relief, he found the omentum thickened and adherent to the mesocolon, and explained this condition by supposing a transfer of inflammation to have taken place from the intestines. He imagines a similar transfer of inflammation to explain the generation of the purulent fluid found in the abdominal cavity of a woman dead of a painful diarrhœa, in April, 1787, (T. II, p. 314,) but it is worthy of note that he did not record that he actually observed any intestinal inflammation in either of these cases. The modern view of the relation of intestinal inflammation to diarrhœa seems first to have been suggested, as a conjecture, by J. Carmichael Smyth—*Of the different kinds or species of Inflammation*, [read January 8, 1788,] Med. Communications, London, Vol. II, 1790, p. 168—who remarked, in his sketch "of the inflammation of mucous or pituitous membranes:" "I think it also probable, (for we can have no positive evidence of the fact,) that in diarrhœas, from catching cold, the villous or interior coat of the stomach and intestines is sometimes slightly inflamed," (p. 210.) He pointed out the similarity in the general characters of the inflammations of the Schneiderian, the pulmonary and the gastro-intestinal mucous membrane, as well as the difference in symptoms belonging to each, and observed: "Thus, what occasions sneezing in one place excites coughing in another, and purging in a third." Compare with these utterances the remarks made a few years later, on "diarrhée catarrhale," by Pinel—*Nosographie Philosophique* [1798]—I cite 6me éd., Paris, 1818, T. II, p. 316. Matt. Baillie, in his *Dissections*—I cite Wardrop's edition of his works, London, 1825, Vol. I, p. 210—remarked: "It does not always happen, when a person has died from purging, that there are ulcers in the intestines. In two cases, which I have opened, of persons who died from this complaint, the small intestines were inflamed, so as to preserve the appearance of distinct vessels, the small branches of arteries curling most beautifully on the outer surface of the intestine filled with florid blood, and the villous coat being slightly red. The great intestine was contracted, especially towards the rectum, and filled only with mucus, there being at the same time no inflammation in it." For an account of the modern views with regard to the conditions referred to the reader may consult, besides the works mentioned in the first note on page 266 *supra*, the following: Broussais—*Hist. des Phlegmasies*, 3me éd., Paris, 1822, T. II, p. 517 *et seq.*; C. Billard, *De la Membrane Muqueuse Gastro-intestinale*, Paris, 1825, p. 126; David Craigie, *Elements of General and Pathological Anatomy*, Edinburgh, 1828, p. 688; G. Andral, *Précis d'Anatomie Pathologique*, Brussels, 1837, Tome I, p. 343; Carl E. Bock, *Lehrbuch der pathologischen Anatomie*, 2te Aufl., Leipzig, 1849, S. 328; also 4te Aufl., 1864, S. 430; August Förster, *Handbuch der speciellen pathologischen Anatomie*, Leipzig, 1854, S. 65; also 7te Aufl., 1864, S. 206; Samuel Wilks, *Lectures on Pathological Anatomy*, London, 1859, p. 295; also 2d ed. (Wilks and Moxon) 1875, p. 404; H. Lebert, *Traité d'Anatomie Pathologique*, Tome II, Paris, 1861, p. 201; Carl Rokitansky, *Lehrbuch der pathologischen Anatomie*, 3te Aufl., Vienna, 1861, Bd. III, S. 201; E. Klebs, *Handbuch der pathologischen Anatomie*, Berlin, 1868, S. 238. Consult also E. E. Lloyd—*Special report of an outbreak of jail diarrhœa, assuming a choleraic form, in the district jail of Nellore, during the months of September and October*, 1866, The Madras Quarterly Journal of Medical Science, January, 1867, p. 17—for an interesting account of the pathological appearances in a number of cases of acute diarrhœa terminating fatally after a few days' illness.

‡ Case 402 may be cited as an illustration of the early development of intestinal ulcers. This man died about two weeks after he was first taken sick with acute diarrhœa, and irritability of the stomach was a marked feature in his case. The diagnosis recorded is acute gastro-enteritis—"The lower two feet of the ileum and the whole of the large intestine were studded thickly with small recent ulcers, very few exceeding a pin's head in size."

particular from those observed in certain mild cases of dysentery. It also frequently happens in diphtheritic dysentery, with intense pseudomembranous inflammation of the large intestine, that the small intestine presents lesions identical with those which are now to be considered. Moreover, the inflammation of the mucous membrane of the large intestine, and of the small intestine between the thickened patches of Peyer, which is of constant occurrence in typhoid fever, differs anatomically in nothing from the inflammation observed in acute diarrhœa. It must be understood, therefore, that many cases of dysentery and fever furnish additional material for the study of simple inflammation of the intestinal mucous membrane, and that much of the description about to be presented applies also to these diseases, as will be more fully explained hereafter in connection with each.

The fragmentary and imperfect character of many of the autopsies included in the foregoing section has already been alluded to, and the reasons which induced the preservation in this work of so many incomplete observations have been briefly indicated.* The imperfection in the record then alluded to is particularly felt when the attempt is made to classify the autopsies so as to select those which may be used for the purposes of the present inquiry. It is, of course, not surprising that in many of the fatal cases no autopsy was made; and some of these have been selected for publication, as, for example, cases 44, 51, 56, 59, 76, 77, 95 and 861. Nor is it remarkable that among the cases in which autopsies were made, there should have been some in which the abdominal viscera were so glued together by chronic peritonitis that it was not found convenient to examine the intestinal mucous membrane, as happened in cases 600, 657, 666, 729 and also in 667, in which last case it is recorded merely that "the intestines themselves were green and rotten," probably from post mortem changes. But it must certainly seem strange that autopsies should have been made, in cases in which the patient was known to have suffered from diarrhœa or dysentery, without examining the intestinal mucous membrane, or at least without recording the conditions observed. This was actually done in quite a number of instances, the attention of the officers by whom the examination was conducted appearing to have been arrested by some intercurrent lesion which was, or was supposed to be, the immediate cause of death. As examples of this oversight in cases of acute diarrhœa I may mention case 424, in which the patient died of diphtheria forty days after he was first taken on sick report for diarrhœa, and case 535, in which death took place from erysipelas and pneumonia nine days after admission from regimental hospital. As instances of the same oversight in sub-acute and chronic cases, the following may be cited: Case 104, the patient suffered also from albuminuria, and empyema was the immediate cause of death. Cases 181 and 188, death took place from pneumonia; supervening in case 181 upon tubercles of the lung. Case 190, the patient had also suffered from fistula in ano; death took place from phthisis. Case 245, the patient died of peritonitis; the surface of the abdominal viscera was spotted with coagulable lymph. Case 251, death from scurvy. Case 404, death from convulsions; a tiny abscess was found in the left hemisphere of the brain, and the lower and posterior portions of the right lung were in the stage of gray hepatization. Case 570, death from diphtheria. Case 586, the patient had received a blow in the epigastrium, and suffered from nausea and vomiting, with diarrhœa at intervals; "the diarrhœa gradually grew worse" until death; on the autopsy pseudomembranous inflammation of the stomach was found, but nothing is said of the condition of the rest of the alimentary canal. Case

* *Supra*, p. 102.

612, the patient died suddenly, and the attention of the officer who made the autopsy appears to have been diverted from the intestinal canal by a heart-clot, which he imagined to have been the cause of death. Case 683, death was caused by strangulation of a portion of the ileum, which had passed through an opening in the mesentery. Case 702, death was apparently due to valvular disease of the heart. Case 711, the patient died of œdema of the epiglottis. Case 770, death from meningitis; the patient had also tubercular disease of the lungs. Case 818, death from gastritis.

To the foregoing I may add two cases in which it is explicitly recorded that the small intestine was healthy, but in which no examination of the large intestine was made, or, at least, if this portion of the alimentary canal were inspected, it was not thought worth while to record the appearances observed, the medical officer making the autopsy being probably of the common opinion already alluded to,* that the lesions of diarrhœa are to be sought chiefly in the small intestine. One of these, case 390, was an example of acute diarrhœa, accompanied by vomiting, frequent pulse and rheumatic pains, in which the patient was apparently convalescent after a four weeks' illness, but had a relapse and died of facial erysipelas. The other, case 180, was an example of chronic flux in a patient who suffered also from dropsy, and who appears to have died of bronchitis and congestion of the brain.

There are, besides, several cases in which it is true the intestines were examined, but in which the medical officer, having taken care to record that "no ulceration was found in any part of the intestinal mucous membrane," or that "no intestinal ulceration was detected," did not think it worth while to add any further remark, so that the actual condition of the intestinal mucous membrane must remain a matter of conjecture. I cite, as examples, one sub-acute case, No. 539, in which, after a few weeks' illness, the patient was apparently convalescent, but had a relapse and died, probably from the diarrhœa rather than from any intercurrent affection; and several chronic cases, viz: Case 252, a paroled prisoner of war, who reached the hospital in a deplorable condition, and in whom the immediate cause of death was pneumonia; case 540, in which the patient succumbed to dropsy of the pericardium, and case 582, in which the cause of death was œdema of the lungs. I may add to this series of imperfect observations case 633, in which it is merely recorded that "some congestion of the abdominal viscera was found," without stating whether the intestinal mucous membrane was examined or not.

It would hardly seem likely that acute diarrhœa could exist with such intensity as to cause death, without producing any lesion of the intestinal canal of sufficient gravity to be recognized on the autopsy, still less that this could happen in chronic cases. It does not, however, appear improbable that if death should take place from some other disease in patients suffering from a mere diarrhœa of irritation, in whom at most a certain degree of hyperæmia of the mucous membrane was the only lesion, it might sometimes happen that the congested vessels might contract sufficiently during the death agony to expel the greater part of the contained blood, and that nothing abnormal should be detected in the intestinal canal even by the most practiced eye.† I am not, therefore, disposed to discredit

* *Supra*, p. 266.

† RILLIET et BARTHEZ—*Traité clinique et pratique des Maladies des Enfants*, Paris, 1843, Tome I, p. 491—found the intestinal tube in a perfect state of integrity in one of every twelve infants in whom a more or less abundant diarrhœa had preceded death—a result deduced from the comparison of nearly three hundred autopsies.—NIEMEYER—*Lehrbuch der speciellen Pathologie und Therapie*, 7te Auflage, Berlin, 1868, Bd. I, S. 623—states that on the post mortem examination of children dead of chronic diarrhœa it is common to find nothing but the *easily-overlooked* residua of chronic intestinal catarrh. The same author has also pointed out (*loc. cit.*, p. 617) that in the intestinal catarrh of adults it sometimes happens that the injection disappears completely, leaving the mucous membrane pale and bloodless.

all the instances contained in the last section in which it is recorded that the intestinal canal was healthy, or that no lesion could be discovered, although doubtless in some cases the medical officers by whom the examinations were made could hardly be regarded as experts, and in others there is no evidence that the patient actually had diarrhœa except the entry on the hospital register, which may not always have been accurate.

I note in all twenty cases belonging to the category under consideration, in ten of which no further evidence exists that the patient really suffered from diarrhœa than that just alluded to. Three of these cases, 125, 127 and 129, belong to the careful series of autopsies reported by Professor Joseph Leidy, of the University of Pennsylvania; all the patients were admitted August 10, 1862, from the Army of the Potomac, then at Harrison's Landing, Virginia. Case 125 died the day after admission, from pleuro-pneumonia. In the two other cases the cause of death was not determined. Case 127 died three days after admission; "the thoracic and abdominal vicera exhibited no perceptible lesions." Case 129 died two days later, "apparently of debility." "No anatomical lesion was discoverable in any of the thoracic or abdominal viscera." I incline to the supposition that the last two cases were really deaths from scurvy. In two of the remaining cases the diagnosis recorded on the register is simply "diarrhœa." In case 485, the patient died eleven days after admission, of congestion of the lungs; "nothing else abnormal was observed." In case 584, "no evidences of disease were recognized in the intestinal canal; and, in fact, nothing was discovered during the autopsy which could satisfactorily account for the fatal result," resembling in this respect the two cases of Dr. Leidy, just mentioned. In the other five cases the diagnosis recorded on the hospital register was "chronic diarrhœa." In case 462, the patient died a week after admission from his regiment, of meningitis and pneumonia. In case 774 death was caused by empyema. In cases 795 and 822 the cause of death was pneumonia, and in the latter instance a number of small abscesses were found in the liver. In case 829 the cause of death was phthisis.

But, besides the ten cases just considered, there are ten others in which no lesion of the intestinal canal could be found, although, from the symptoms recorded, or from the fact that the patient passed through several hospitals, in all of which he was registered as suffering from diarrhœa, no reasonable doubt can exist that he really was affected with that disease. One of these, case 321, was apparently an example of the acute form of the disease complicating an attack of pneumonia; the patient died, two days after admission from his regiment, of the latter disease. While in hospital he had watery, offensive stools, but "nothing abnormal was observed in any portion of the intestinal canal." Another, case 438, was recorded on the hospital register simply as "diarrhœa." The patient said "he had suffered from diarrhœa for some time," and died of pneumonia four days after admission from the field hospital; "no disease was detected in the stomach or bowels." The remaining eight cases were recorded on the hospital register as "chronic diarrhœa," and in each of them there appears to be collateral evidence that the disease was correctly named. Case 110 died of pleuropneumonia after having suffered from chronic diarrhœa, according to the record, for more than nine months. Case 187 is reported to have had scurvy as well as diarrhœa; the cause of death was a hæmorrhage into the right pleural sac, the source of which was not made out. Case 235 was also complicated with scurvy; the passages are reported to have been "numerous, bloody, and attended with tenesmus," representing dysentery rather than diarrhœa; general venous congestion was observed

after death; "the blood was dark and not coagulated in the heart," but "nothing was found in the organs to explain the cause of death." Case 515 was complicated with insanity, and the cause of death was not satisfactorily made out. Case 606 died of phthisis; "the discharges from the bowels were frequent, watery, and very offensive;" "the mucous membrane of the stomach was thickened and congested," but "no intestinal lesions, such as would account for the diarrhœa, were recognized." Case 790 died of pneumonia. "He had frequent passages accompanied with pain and tenesmus;" "the mucous membrane of the stomach was inflamed," and there was an intussusception in the lower third of the ileum, but no other abnormity was observed in the intestinal canal. Case 793 died of pleuropneumonia; "nothing abnormal was detected in the abdominal viscera." Case 817 was one of Addison's disease; the patient had also "suffered from chronic diarrhœa for several months and was very much emaciated; the stools were frequent and watery," but the "intestinal canal presented no evidences of disease."

To the twenty cases just discussed, case 115 may, perhaps, be added; the patient had phthisis also, and died of hæmorrhage of the lungs; he appears on the registers of several hospitals as suffering from chronic diarrhœa, but "the stomach and intestines were nearly normal, the latter showing very little to account for the long-continued chronic diarrhœa from which the patient had suffered."

After excluding all such negative cases as those just referred to, there still remains a considerable number of autopsies in cases of acute, sub-acute, and even of chronic diarrhœa, in which the intestinal canal presented evidences of hyperæmia or catarrhal inflammation merely, without ulceration. Before attempting any analysis of these cases it will be convenient to present a sketch of the conditions observed.

*Inflammation of the mucous and submucous coats of the intestines without ulceration.*— In some of the fatal cases of acute diarrhœa the only intestinal lesion observable with the naked eye was a reddish discoloration of the mucous membrane, which, for the most part, occurred in patches of various dimensions from a few inches to several feet in length. Such patches were observed in all parts of the intestinal canal, but were more common in the ileum than in the jejunum, and were still more frequent in the colon, where they particularly affected the cæcum and sigmoid flexure. A continuous redness of the whole colon and of the lower part of the ileum was occasionally observed, but usually the patches were separated from each other by areas in which the mucous membrane appeared to be quite normal. The instances in which the small intestine alone was affected were very few, and probably even a part of these must be regarded as imperfect observations; those in which the large intestine alone was inflamed were common, and very often both were involved, the large intestine, however, being usually most extensively diseased.

The patches varied in color from pale pink to deep red or even livid purple. When portions of the gut were spread out over a white surface, or held between the eye and the light, arborescent figures, due to the distention of the small veins with blood, were generally conspicuous. Sometimes, also, small spots or blotches of irregular form and of a darker color than the rest of the patches were observed. Such small purpura-like blotches occasionally occurred also in the midst of apparently healthy portions of the mucous membrane. In some instances the reddened patches seemed to be quite normal in texture; in others the mucous membrane was more or less softened, so that it could readily be broken down and scraped off with the handle of the scalpel; occasionally it was œdematous. The dis-

eased mucous surface was generally coated with a glairy mucus, which was either quite colorless or of a yellowish, reddish, brownish or greenish hue, from the admixture of bile or blood; more rarely the surface was covered with a creamy muco-purulent coating. The peritoneal surface of the intestine corresponding to these reddish patches was generally quite normal, but sometimes in a condition of more or less pronounced hyperæmia, and occasionally thinly coated with a layer of opaque yellow lymph. Microscopical examination of these reddened patches showed their color to be due either to an engorgement of the small veins and capillaries with blood, to transudation of the coloring matter of the blood, to actual hæmorrhage into the mucous membrane and the sub-mucous layer, or to a combination of these conditions.

In the majority of cases the solitary follicles situated in the reddened patches were more or less enlarged; the most common condition, perhaps, being that in which they had attained the size of pin-heads, and appeared as whitish or yellowish elevations surrounded by a little circlet of increased vascularity. In the colon these minute elevations were generally sessile; in the small intestine they often had constricted necks, and projected from the surface of the mucous membrane like tiny polypi.*

Reddened patches, such as those above described, have been variously interpreted by the pathological anatomists. Regarded as evidences of inflammation by some, of congestion by others, they have also been looked upon as being mere post mortem alterations in very many cases at least. Lebert† has drawn attention to the circumstance that patches of venous or even capillary hyperæmia are met with in the bodies of subjects who have not suffered from any intestinal disease during life, and lays down the rule that unless, besides the redness, some alteration of texture, such as softening or induration, exists, or the coats of the intestine are thicker or thinner than normal, we should not admit the presence of inflammation. This rule must be accepted with a certain degree of reservation, so far, at least, as softening and abnormal thinness are concerned, for certainly the softening of the mucous membrane which takes place during commencing decomposition is even more

* I have searched for pictorial representations of simple acute and chronic non-ulcerative inflammation of the intestinal mucous membrane, as it occurs in diarrhœa, without finding much of interest. For representations of the redness and other changes of color, I may cite FERDINAND LESSER—*Die Entzündung und Verschwärung der Schleimhaut des Verdauungskanales*, Berlin, 1830, Tab. IV, Figs. 2 and 3; J. HOPE—*Principles and Illustrations of Morbid Anatomy*, London, 1834, Figs 116, 123, 124, 127, 128 and 129; ROBERT CARSWELL—*Illustrations of the Elementary Forms of Disease*, London, 1838, Inflammation, Plate II, Figs. 1, 2, 3 and 4; Melanoma, Plate III, Fig. 6. For illustrations of enlargement of the solitary glands, with or without pigment deposits, I may cite J. HOPE, *op. cit.*, Figs. 142, 143, 144 and 150; R. CARSWELL, *op. cit.*, Melanoma, Plate III, Fig. 5. In the same connection I may also refer to the remarkable etchings in the work of RŒDERER and WAGLER—*De Morbo Mucoso*, Gœttingen, 1762; and to the representations of enlarged solitary follicles in both small and large intestines of children dead of cholera infantum, by WM. E. HORNER—*Treatise on Pathological Anatomy*, Philadelphia, 1829, Plate III. See also a splendid colored plate in the work of H. LEBERT—*Traité d'Anat. Path.*, Paris, 1861, Tome II, p. 315, Plate CXXI, Figs. 1 and 2—representing a curious case of extreme hypertrophy of the villi just above the ileo-cæcal valve, in the case of a woman who died after suffering from diarrhœa several months, and in whom there were also numerous small follicular ulcers of the colon. On the other hand, the intestinal catarrh of Asiatic cholera has furnished a considerable number of excellent illustrations which represent a condition very similar to that observed in many cases of acute diarrhœa, and which may be advantageously compared with the illustrations about to be presented. Among the most noteworthy of these I may refer to J. CRUVEILHIER—*Anat. Pathologique du Corps Humain*, Paris, 1829–'35, Tome I, Liv. 14, Pl. 1–5; A. AUVERT—*Selecta Praxis Medico-chirurgicæ*, Paris, 1856, Tab. CV, CVI, CVII; H. LEBERT—*op. cit.*, Pl. CXV, CXVI and CXVII; J. F. H. ALBERS—*Atlas der Path. Anat.*, IV Abth., Bonn, 1862, Tab. XIII; also HAYDEN and CRUISE—*Report on Cholera*, (epidemic of 1866,) Dublin Quarterly Jour. of Med. Science, May, 1867, p. 345, (also reprint,) which contains three striking wood-cuts. I may also mention that the Museum contains three specimens of the small intestine from soldiers dead of Asiatic cholera, Nos. 883, 920 and 921, Medical Section, in which the anatomical conditions presented are strikingly similar to those shown in No. 600, which is represented in the photographic plate presented a little further on.

† H. LEBERT—*op. cit.*, Tome II, p. 201. The significance of redness and other discolorations of the intestinal mucous membrane has been the subject of a number of interesting inquiries. The view presented in the posthumous memoir of ROUSSEAU—*Des différens aspects que présente, dans l'état sain, la membrane muqueuse gastro-intestinale*, Archives Gén. de Méd., Tom. VI, (1824,) pp. 321 and 481—that any redness of the gastro-intestinal mucous membrane, whether slight or intense, depends upon congestion or inflammation; though it appeared to be substantially sustained by the observations of several independent inquirers, as, for example: WM. E. HORNER—*Inquiries into the healthy and diseased appearances of the Mucous Membrane of the Stomach and Intestines*, The American Journal of the Medical Sciences, Vol. I, 1827, p. 9, and A. MONRO—*The Morbid Anatomy of the Gullet, Stomach and Intestines*, 2d edit., Edinburgh, 1830, page 315—became untenable after it had been shown that redness might be induced by various post mortem changes. Consult on this subject the work of BILLARD—*De la Membrane Muqueuse Gastro-intestinale*, Paris, 1825, p. 256, and the convincing memoir of MM. RIGOT *et* ROUSSEAU—*Recherches nécroscopiques sur quelques altérations que subissent, après la mort, les vaisseaux sanguins, les poumons et la membrane muqueuse gastro-pulmonaire à l'état sain*, Archives Gén. de Méd., Tom. XII, (1826,) pp. 169 *et* 333. See also G. ANDRAL—*Précis d'Anatomie Pathologique*, Brussels, 1837, Tom. I, p. 327; and W. RAPP—*Annotationes practicæ de vera interpretatione observationum anatomiæ pathologiæ, præsertim ad morbos acutos spectantium*, Tubingen, 1834.

apt to be confounded with inflammatory softening than hypostatic congestion with inflammatory redness; and the intestinal walls may be exceedingly attenuated, as, for instance, from long-continued relaxation or paralysis of the muscular coat, without the slightest reason existing for believing that they have been inflamed. Microscopical examination of thin sections, whether cut extemporaneously after freezing, or more deliberately prepared after hardening the affected portion by suitable reagents, offers a more reliable method of making the discrimination, by exhibiting the presence or absence of the characteristic alterations to be presently described. By this method we shall not fail to be convinced that the reddened patches are very often to be regarded as merely hyperæmic, while in other instances they are undoubtedly inflammatory; and will find that the latter is almost always the case when the solitary follicles of the reddened patches are visibly enlarged, or in the case of the small intestine whenever the villi of the affected portion are visibly tumefied.

When the disease had lasted for several weeks, or when the patient had suffered from repeated attacks of diarrhœa before his fatal sickness, the bright-red color of the patches was replaced by the various shades of mahogany-red, brown, slate-color, or green, characteristic of chronic inflammation of the mucous membrane; and pigment deposits in the closed follicles were of frequent occurrence. Softening of the mucous membrane was, perhaps, more frequent in the chronic than in the acute cases. On this subject, however, I desire to speak with great caution, in view of the danger of confounding post mortem changes with morbid alterations, especially as I am satisfied that the inflamed mucous membrane usually undergoes putrefactive changes sooner after death than the normal. A still more striking lesion, sometimes observed in the chronic cases, was a progressive thickening in the submucous connective tissue, which in extreme cases became also brawny, inelastic and friable.

In the presentation of further anatomical details it will be convenient to consider, first, the conditions to be observed in the small intestine, and, subsequently, those encountered in the large.

*Lesions observed in the Small Intestine.*—When patches of inflammation were seated in the small intestine the villi of the affected portion were usually more or less tumefied. When this condition was well marked the surface acquired a plush-like appearance which was quite characteristic. With a lens it was easy to observe in these patches that many of the villi were club-shaped from the disproportionate enlargement of their extremities; others were elongated and thickened, but without marked distortion. The enlargement of the closed glands of the affected portion was generally more marked in the case of the solitary follicles than in the patches of Peyer. The latter were usually so slightly swollen as hardly to attract attention, even in cases in which the solitary follicles projected as little pin-head tumors above the surface of the mucous membrane; but the deposits of pigment already mentioned as occurring in the protracted cases, and in subjects who had suffered from previous attacks, were even more common in the patches than in the solitary follicles, and gave rise to characteristic appearances which were to be found in a large percentage of the autopsies made during the war.

The chromo-lithograph facing this page represents this very common condition, in which the pigment deposits remaining after former attacks complicated the appearances of the more recent process. The specimen was obtained from an autopsy made at the Judiciary Square hospital, Washington, D. C., Assistant Surgeon E. J. Marsh, U. S. A.,

surgeon in charge, and was brought immediately to the Museum, where the water-color drawing reproduced in the plate was made by Mr. H. Faber. The following very brief history of the case was furnished:

CASE 879.—Private Henry M. Pierce, company K, 25th Maine volunteers, was taken sick while with his regiment near Chantilly, Virginia, March 23, 1863. The diagnosis on the regimental register is simply "fever." Continuing to grow worse, he was sent to Washington and was admitted to Judiciary Square hospital, April 13, 1863. Diagnosis, remittent fever. The febrile symptoms were accompanied by diarrhœa, from which he had previously suffered several times. He did well under treatment, and was apparently convalescing, though the diarrhœa still continued to the extent of several stools a day, when pneumonia supervened and was the cause of death, May 11th. *Autopsy:* The lower portion of both lungs was hepatized. The greater part of the ileum presented the conditions exhibited by the specimen. The mucous membrane of the colon was darkly reddened, but no marked enlargement of the solitary glands of the colon was noticed.

The piece represented was selected from about the middle of the ileum. It will be observed that the general surface of the mucous membrane is of a reddish cream-color, becoming more distinctly red in the lower portion of the specimen. On this surface distended veins of a rich crimson color ramify in an arborescent manner. Three Peyer's patches are observable. The larger, situated in the lower part of the specimen, is an elongated ellipse about an inch and a half long by rather more than half an inch broad; a little over two inches above the upper extremity of this patch is the second, which is somewhat rounded and rather more than a quarter of an inch in diameter; an inch higher, and rather to the left, is the third patch, elliptical in form, three-quarters of an inch long and about as broad as the first. The first and largest of these patches is very slightly thickened, the others not perceptibly so; but in all the patches the follicles are the seat of bluish-black pigment deposits, giving them the "shaven-beard" appearance, which will be described hereafter. The solitary follicles are enlarged, and project above the mucous surface as yellowish pimples nearly the size of mustard seed, each of which is seated on a little circular reddened area. These enlarged follicles are most numerous in the lower part of the specimen. They do not contain any deposit of black pigment. The whole surface of the piece presented a somewhat plush-like texture, to which the plate hardly does justice, but otherwise the representation is quite accurate.

This specimen represents the condition of the mucous membrane of the ileum after it had been the seat of an inflammatory process of moderate intensity, but of several weeks' duration. As the patient had previously had several attacks of diarrhœa, it seems probable that the pigment deposits in the patches of Peyer antedated the last illness. The same may possibly be true, to a certain extent at least, with regard to the enlargement of the solitary follicles.

A chromo-lithograph, representing a portion of the ileum in a condition very similar to that just described, was published in my preliminary report in Circular No. 6, (Surgeon General's Office, 1865,) facing page 146. In that case, which will be given in detail in a subsequent chapter, the patient, private Lewis Sage, company A, 186th New York volunteers, died December 10, 1864, in the 3d division of the Alexandria general hospital, of a febrile disorder, which was recorded on the hospital register as typhoid fever. When brought to the hospital, ten days before death, he stated that he had suffered from diarrhœa for several months. On the autopsy the ileum was found in a condition very similar to that described above. The colon was ulcerated, especially at its extremities. In the transverse colon several of the ulcers were cicatrizing.

The plate now presented is rather more elaborately executed than that published in Circular No. 6, but either of them will serve to give a just notion of the appearances

presented by the inflamed mucous membrane of the ileum in subjects suffering with diarrhœa. A greater or less degree of redness and vascularity; greater or less tumefaction of the closed glands; occasional absence of any pigment deposit in Peyer's patches, or presence of a spot of pigment in each of the solitary follicles—these were the chief variations resulting from the varying duration and intensity of the disease.

When such preparations as those under consideration are immersed in alcohol for preservation the abnormal color speedily disappears; but if the closed glands are enlarged, or the villi hypertrophied, these conditions are well displayed, even when the pieces are long preserved, as may be seen in a number of specimens in the Army Medical Museum, some of which have already been described in Section III, while others will be presented in the next chapter. From the series I have selected two for photographic representation in this place. The first is from a case of diarrhœa of nearly two months' duration.

CASE 880.—Corporal George W. Stearnes, company I, 9th New Hampshire volunteers, was mustered into service August 15, 1862, to serve three years. There is no record of the time at which he was first taken sick; but he appears on the register of the general field hospital of the 9th Corps, near Harper's Ferry, Virginia, as under treatment for diarrhœa November 5th; sent to Alexandria November 12th. He is borne on the register of the convalescent hospital at Fort Ellsworth, near Alexandria, Virginia, admitted November 16th, general debility; no disposition recorded. The register of Fairfax Seminary hospital, near Alexandria, Virginia, shows that he was admitted to that hospital December 8th—chronic diarrhœa—transferred to Philadelphia, December 15th. He is borne on the register of the Satterlee hospital, West Philadelphia, admitted December 16th—chronic diarrhœa. December 23d, papers were made out for his discharge from service by reason of "great debility and emaciation, the result of chronic diarrhœa, which is still unchecked." Pending the approval of these papers by the proper authority, he died, December 24th, at 5 A. M. From the circumstance that his discharge papers were made out the day before his death it is to be presumed the fatal issue was unexpected. The autopsy was made during the afternoon of the same day by Professor Joseph Leidy, of the University of Pennsylvania, who forwarded the following statement to the Surgeon General's Office with the specimens: *Autopsy:* Age about 30. The body was rather emaciated. The chest and abdomen presented a number of faint spots of purpura. The brain was healthy. There were no pleuritic attachments, nor was there any pleurisy on either side. Lobular pneumonia was observed in the lower lobes of both lungs; the inflamed lobules were numerous—varied from the size of a marble to that of a walnut—and were in the stage of gray hepatization. Evidences of bronchitis were also observed. The heart was healthy. The stomach was exceedingly contracted. The liver was apparently sound; the gall-bladder enormously distended with green bile; the spleen small but healthy; the pancreas and kidneys sound. The intestines were inflamed throughout; in the small intestine the inflammation increased in intensity toward the ileo-cæcal valve; the agminated glands were slightly thickened and dark-red with inflammation; the solitary glands were enlarged, and looked like yellow mustard seeds sprinkled on a red ground. The large intestine was streaked and spotted with ash-color and dark-red on a nearly uniform red ground; there were also spots of ecchymosis, and the epithelium was softened.

Nos. 93 to 98, Medical Section, Army Medical Museum, are from this case. The specimens are six successive portions of the ileum. In Nos. 93 and 94 there are well-marked valvuli conniventes, and some hypertrophy of the villi, giving a velvety appearance to the surface. The solitary follicles are enlarged to the size of small pin-heads and project above the surface of the mucous membrane. In No. 94 there is a small Peyer's patch, which is a little more distinct than normal. In Nos. 95 to 98 there are no valvuli conniventes, no hypertrophy of the villi is observable, and the intestinal walls are thinner than normal. Each of these pieces presents a number of enlarged solitary follicles, which are most conspicuous in No. 98. In both 97 and 98 there is a slightly-thickened Peyer's patch. No portion of the large intestine was preserved.

The plate facing this page is a reproduction of a photograph of No. 98, which represents it of the natural size. This piece was taken from near the ileo-cæcal valve. Just above its middle is a thickened Peyer's patch, which appears as a dark elliptical spot two inches long by an inch in transverse diameter near its middle. This is crossed obliquely from above downwards by a wrinkle in the mucous membrane, produced accidentally by the method of preparing the specimen. The surface of the patch is not materially elevated above the surface of the surrounding mucous membrane, yet it is thicker than

*Heliotype.* *James R. Osgood & Co., Boston.*

ILEUM WITH ENLARGED SOLITARY FOLLICLES.

No. 98. MEDICAL SECTION.

normal, and, when examined by transmitted light, appears more opaque than any of the other patches observed in this subject. The enlarged solitary follicles are scattered over the rest of the mucous surface as little pimple-like projecting tumors, which are largest and most numerous in the lower half of the piece; the largest of them, however, do not exceed pin-heads in size. Owing to the tenuity of the mucous membrane, the course of the circular fibres of the muscular coat is plainly indicated by numerous transverse lines. For the same reason the arborescent branching of the blood-vessels is also indicated in several places.

In the specimen selected for the second illustration the villi are considerably hypertrophied, giving the surface a plush-like aspect. The patient died in the Third Division of the Alexandria general hospital after an illness of about a month. The following account of the case was forwarded to the Museum with the specimens by Acting Assistant Surgeon Wm. C. Miner:

CASE 881.—Private Erastus Boyd, company G, 195th Ohio volunteers; admitted July 29, 1865. Diarrhœa. [This man was mustered into service February 20, 1865, to serve one year. He appears on the hospital register of his regiment as "sick," July 27th; no diagnosis recorded. "Sent to general hospital."] At the time of admission the patient was feeble, his pulse weak, compressible, 80 per minute; tongue moist, slightly coated, its tip and edges clean. He said he had had diarrhœa for three or four weeks. July 30th: ℞. Blue-pill and opium, of each eight grains, extract of nux vomica two grains. Make eight pills. Take one every three hours. Brandy. Milk diet. July 31st: No change. August 1st: The symptoms have assumed a typhoid character; the tongue is black and dry, and delirium has set in. ℞. Chalk mixture four ounces, tincture of catechu one ounce, tincture of opium four drachms. Take a teaspoonful every three hours; also turpentine and tincture of cinchona. August 2d: Better. Continue treatment. August 3d: A good deal better; tongue moist; has had but four stools in the last twenty-four hours. August 5th: Still improving; begins to relish his food. Continue treatment. Died, suddenly, August 6th, having been up fifteen minutes before. The cause of death recorded on the hospital register was "typhoid fever." *Autopsy:* The only point which attracted attention was the condition of the intestinal canal. The solitary follicles throughout the ileum were enlarged, and there was slight thickening of the patches of Peyer, several of which presented one or more minute ulcers. The colon was closely studded with minute follicular ulcers about the size of pin-pricks.

Nos. 600 and 601, Medical Section, Army Medical Museum, are from this case. No. 600 is a portion of the ileum taken a few feet above the ileo-cæcal valve, and is the specimen selected for representation in this place. No. 601 consists of the last three inches of the ileum, with the ileo-cæcal valve and a portion of the cæcum. The ileum presents appearances very similar to those which will be described in connection with No. 600. The cæcum presents a number of the minute follicular ulcers mentioned in Dr. Miner's account of the autopsy as existing in the colon.

The plate facing page 302 is a reproduction of a photograph of No. 600, which represents it of the natural size. The mucous surface of the piece is marked by a number of transverse rugæ, which are the imperfectly-developed valvulæ conniventes. The hypertrophy of the villi gives the whole mucous surface a plush-like appearance which is exceedingly characteristic, and which can be studied advantageously with a lens. A number of enlarged solitary follicles the size of pin-heads project slightly above the mucous surface as rounded elevations. In the lower half of the specimen there is a Peyer's patch two inches and a half long by three-quarters of an inch wide at its broadest part. The position of this patch is plainly indicated by the absence of the transverse rugæ above referred to, which terminate rather abruptly at the margins of the patch. The surface of the patch, which is not materially elevated above the surrounding mucous membrane, is marked by irregular narrow transverse broken lines, on which are seated numerous hypertrophied villi similar to those of the surrounding mucous membrane; between these are narrow irregular areas on which there are no villi, and which, hence, appear somewhat depressed below the general surface. The general effect of this arrangement is to give the surface of the patch a somewhat reticulated appearance. At the center of the patch there

is a shallow oval ulcer an eighth of an inch in diameter. A little more than half an inch below this, near the right-hand margin of the patch, is another similar ulcer, and a third smaller one will be noticed at the upper extremity of the patch.

This specimen was selected, after an examination of the whole intestine, as fairly representing the condition of the Peyer's patches in this case. All of them appeared somewhat more opaque than natural when examined by transmitted light, but none were thicker or more prominent than the one represented in the plate. The large patch immediately above the ileo-cæcal valve, which is exhibited in No. 601, differs from that shown in the plate only in its outline; the appearance of its surface is precisely the same. In it, also, there is a single small ulcer similar to those shown in the patch of No. 600. None of the patches of Peyer in this case presented any larger ulcers than these, and in many of them there were no ulcers. Here, therefore, we have to do with a much less extensive disease of Peyer's patches than that which is characteristic of typhoid fever.

In the cases which furnished the specimens from which the three previous illustrations were taken the inflammatory process had lasted several weeks before death, and in two of them, viz: Pierce and Boyd, the patients had presented symptoms of fever, which, in the former case, was recorded on the hospital register as remittent, in the latter as typhoid, fever. The discussion of the interesting question of the relation of the lesion just described to a particular form of malarial fever must be postponed to a subsequent chapter; it must suffice at present to express the conviction that the intestinal lesion, in the class of fever cases referred to, presents nothing by which it can be distinguished from the lesions observed in other cases in which the febrile phenomena are not well marked, or at least present no specific characters. In the case of Stearnes, for example, the febrile phenomena were not such as to arrest attention, and the prominent features of the case were debility and emaciation. This case having lasted nearly two months before death, might, no doubt, deserve the designation "chronic diarrhœa," which was assigned to it on the register of the Satterlee hospital, but it differs in no essential respect from cases which terminated fatally in six or four weeks, or even in a shorter time. It will further be noticed that in all three of the cases just presented the large intestine was seriously affected as well as the small. In the case of Pierce, it is described as "darkly reddened;" in the case of Stearnes, "the large intestine was streaked and spotted with ash color and dark-red on a nearly uniform red ground; there were also spots of ecchymosis, and the epithelium was softened;" in the case of Boyd, the cæcum and colon were "closely studded with minute follicular ulcers about the size of pin-pricks." These instances may be taken as examples of the types most frequently encountered.

If to the numerous group of similar cases the yet more extensive group be added in which the condition of the small intestine just described coexisted with the follicular ulceration of the colon characteristic of the chronic forms of flux, or with the diphtheritic sloughs and ulcers of acute dysentery, it will be found that nearly all the cases of simple acute inflammation of the mucous membrane of the small intestine which were actually observed during the war have been included. Certainly, for myself, I must state that neither at the Army Medical Museum, nor in any of the autopsies I witnessed in the military hospitals during the war, did I ever encounter a single case of diarrhœa, whether acute or chronic, in which the small intestine alone was involved. It is true that a number of autopsies are recorded in the last section in which congestion, inflammation, or even

*Heliotype.* *James R. Osgood & Co., Boston*

ILEUM WITH ENLARGED SOLITARY FOLLICLES
AND HYPERTROPHIED VILLI.

No. 600. MEDICAL SECTION.

ulceration of the small intestine, or of some portion of it, is reported, without the statement that any morbid condition was observed in the large. But in the majority of these cases there is no record whatever of the condition of the large intestine; and I am of opinion that this circumstance almost always resulted, as I know by inquiry it did in some instances, from the fact that the medical officer making the examination was so fully impressed with the belief, which was referred to on page 266, that the lesions of diarrhœa were to be sought in the small intestine, that it was not thought worth while to examine the large.

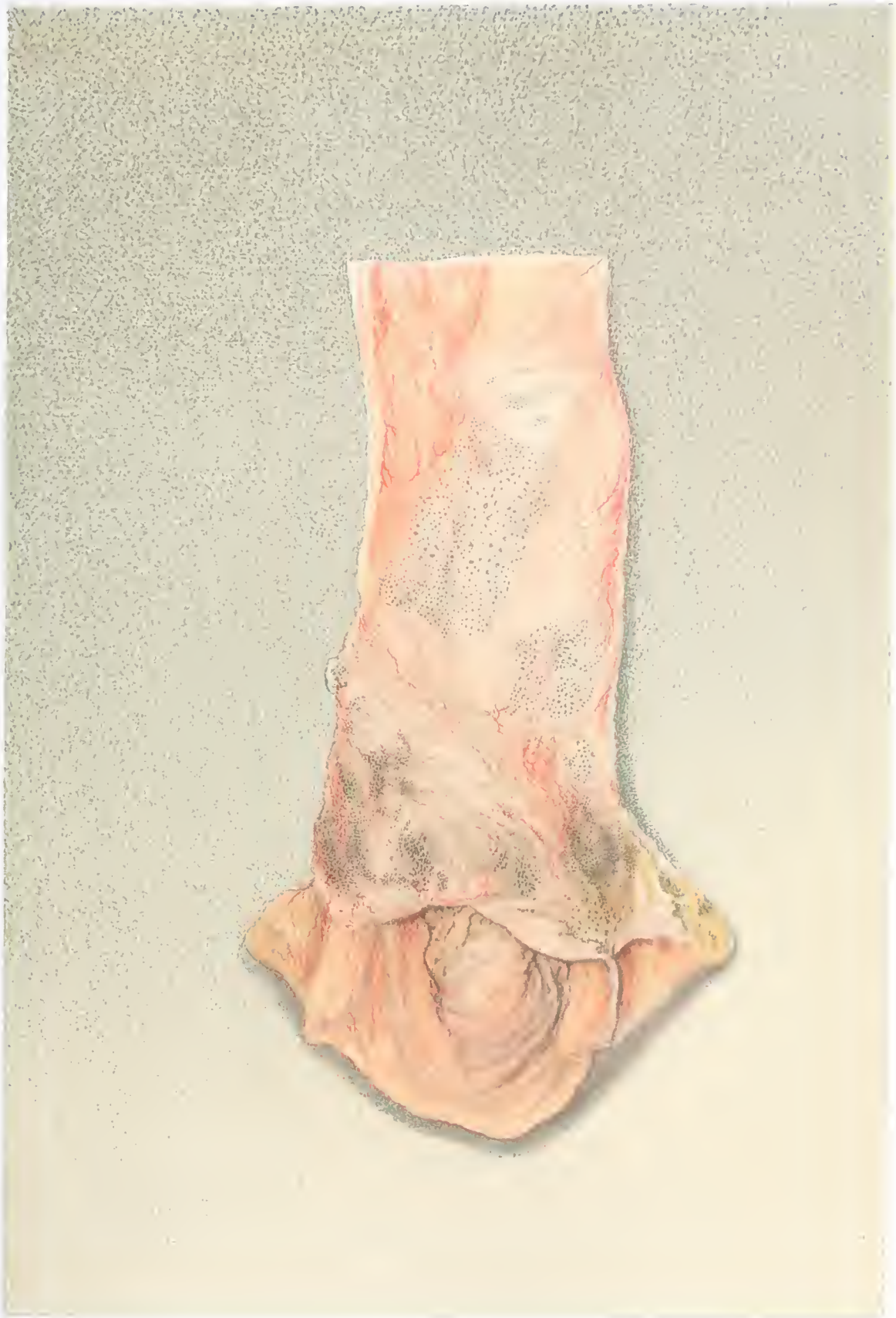
The cases referred to may be briefly analyzed, as follows: In eighteen of them the small intestine is described as being congested or inflamed, while no mention whatever is made of the condition of the large intestine. Seven of these cases occurred in the third division of the Alexandria hospital, viz: Cases 467, 477, 478, 482, 488, 491 and 532; the others are cases 182, 597, 611, 699, 730, 751, 752, 769, 798, 799 and 821. In eight cases ulceration is affirmed to have existed in the small intestine, but the condition of the large is not recorded. Cases 102, 114, 416, 475, 476, 595, 596 and 831 come under this head. Of these, case 476 was doubtless one of typhoid fever, and cases 102 and 596 may possibly have been of the same nature, though the account of the autopsy is too imperfect to warrant a positive decision.

Besides these twenty-six cases characterized by the fatal omission to record the condition of the large intestine, there are four in which it is not explicitly stated that this portion of the bowel was examined, although the reader may perhaps infer that it was, from the language employed. These are cases 184, 224, 481 and 560. Case 184 was a chronic flux, said to have been of three months' standing at the time of admission to the hospital in which the patient died nearly two months later; it is reported that he "slowly sank." On the autopsy the brain was not examined. There were extensive pleuritic adhesions, "both old and recent," on the left side. The spleen was enlarged; the stomach slightly congested. "The small intestines presented numerous ulcers in the neighborhood of the ileo-cæcal valve. The remaining viscera appeared to be normal." Case 224 appears on the hospital register as "chronic diarrhœa;" but the patient stated, on admission to the hospital in which he died a week later, "that he had suffered from diarrhœa for a month." There were pleuritic adhesions, large heart-clots, and twenty or more biliary calculi. "The intestines had a healthy appearance, except about three feet of the lower portion of the ileum, which were inflamed but not ulcerated." In case 481, which had been recorded on the hospital register as "general debility" and "phthisis," the body was much emaciated; the thoracic viscera healthy, with the exception of pleuritic adhesions. "The abdominal viscera also appeared to be healthy, except that there was some ulceration of the mucous membrane of the small intestine." Case 560 appears to have been a severe case of acute diarrhœa in which the patient improved somewhat after he entered the hospital, but on the fifth day after admission "got up to stool, fell down suddenly, and expired in a few minutes." Nothing was found on the autopsy to account for the sudden death of this man. "The ileum was inflamed throughout, but no ulcers were found." The spleen was soft and dark colored; the kidneys somewhat congested. "All the other viscera normal." I cannot say that I am convinced, by the general statement with which the record of the autopsy concludes in cases 184 and 560, that the large intestine was actually examined, and the two others must also be regarded with a certain degree of doubt, since the expres-

sions employed would probably have been used had the small intestine alone been inspected. In this place, also, on account of its vagueness of statement, I would include case 470, in which it is recorded that "the mucous membrane of the ileum was softened and in several places deeply ulcerated. The large intestine was not materially diseased." The name of the observer is unknown, and it is not possible to judge what the exact condition of the colon really was.

There remain, however, six cases in which it is more expressly indicated that the large intestine actually was examined and no disease found, viz: Case 116: The patient "was convalescent from typhoid fever, but was still suffering from diarrhœa, and was much emaciated." He died suddenly. On the autopsy, pleuritic adhesions were found on the left side, and vegetations on the tricuspid and mitral valves. "The jejunum was intensely congested; the rest of the intestines was rather pale, but otherwise healthy." Case 291 is recorded as "chronic diarrhœa;" but no particulars are reported except the autopsy. Pleuritic adhesions were found on the left side; the liver weighed about sixty-four ounces; the spleen was softened; the kidneys large and fatty. The whole small intestine is described as being "thickened, but not ulcerated." "The mucous membrane of the ileum near the ileo-cæcal valve was softened. Peyer's glands were not inflamed, nor were any indications of inflammation observed in the colon." Case 484 is a fatal case of severe acute diarrhœa following measles. The lungs were found slightly congested; the liver and spleen somewhat enlarged. "The mucous membrane of the ileum was softened; that of the large intestine not materially altered." Case 725 is recorded on the hospital register as "chronic diarrhœa;" but no further particulars are reported except that the patient died, about three weeks after admission, of double pneumonia. On the autopsy, besides extensive hepatization of the lungs and enlargement of the liver, spleen, kidneys and mesenteric glands, "there were a few small patches of inflammation in the small intestine. The large intestine was healthy." Case 789 is recorded on the hospital register as "consumption." The patient "complained chiefly of the accompanying diarrhœa, which was troublesome and persistent." His body was greatly emaciated. "The lungs, pericardium and heart were glued together into a mass by firm adhesions, which were interspersed with tubercles of all sizes." The lungs were tubercular and contained numerous cavities. There was some redness of the lower part of the ileum. "The ileo-cæcal valve and the colon were apparently normal." Case 567 is recorded on the registers of two hospitals as suffering from "chronic diarrhœa." He died of pneumonia less than a month after entering the first of the two. On the autopsy, besides the pulmonary lesions, a fatty liver and enlarged spleen were found. "There was marked ulceration in the ileum for six inches above the ileo-cæcal valve; the rest of the small intestine was healthy. The large intestine was not inflamed or ulcerated." It would appear from the autopsy that the last of these cases was probably one of typhoid fever in which the patient was struck down by pneumonia during convalescence; it was common enough for fever cases to be registered as chronic diarrhœa. As to the five remaining cases, which, so far as I have been able to ascertain, are the only ones reported during the war which favor the opinion that the small intestine is the essential seat of the lesion in diarrhœa, the reader will not fail to note their similarity to the cases previously commented upon,* in which no lesion whatever was found in the alimentary canal. Supposing the

* *Supra*, p. 294 *et seq.*



observations to have been carefully made by competent observers, it would seem most probable that they belonged in fact to the category just alluded to. I am disposed to suggest this explanation of case 789; but, unfortunately, in the four remaining cases the medical officer by whom the autopsy was made is unknown, so that the degree of accuracy belonging to these observations must remain a matter of doubt.

Allusion has already been made* to the pigment deposits observed both in subjects who had suffered from several attacks of acute diarrhœa and in the chronic cases. In the small intestine these deposits occur especially in the solitary follicles, in the patches of Peyer, and in the apices of the villi. Diffuse pigment deposits in the mucous membrane also occur as greenish or slate-colored streaks or patches. These, however, are usually associated with the more localized deposits just alluded to, and as these are generally more intense than the diffuse pigmentation, they give the characteristic appearances to the specimen. The pigment deposits in the apices of the villi appear, on close inspection even to the naked eye, as innumerable dark points closely strewn over the whole surface of the affected portion of the mucous membrane, to which it gives a greenish or slate-gray tinge when viewed from a little distance. In the solitary glands the pigment deposits occur as dark dots in the centers of the glands, and the similar deposits in the patches of Peyer produce what has been designated as the "shaven-beard" or "shaven-chin" appearance.

The chromo-plate facing page 304 reproduces a water-color drawing by Mr. H. Faber from a specimen which exhibited this appearance. The piece was brought to the Museum during the summer of 1863 by Surgeon H. Crosby, U. S. volunteers, then in charge of the Columbian hospital, Washington, D. C., who stated that the patient had died of diarrhœa, and that no ulceration had been found in any part of the intestinal canal. All the closed glands of the ileum contained pigment deposits similar to those shown in the specimen, and the greater part of the large intestine resembled the portion of the cæcum here figured.

The plate represents the last four inches of the ileum, the ileo-cæcal valve and a small part of the cæcum. The general surface of the mucous membrane is of a yellowish-cream color, the hue being darker in the cæcum than in the ileum. This tint is variegated by some reddish discoloration and a moderate degree of vascular injection. Just above the middle of the portion of ileum represented, there is an oblong Peyer's patch an inch and a quarter long by three quarters of an inch wide, which presents the shaven-beard appearance. Above this are four much smaller patches of similar character. Below it, near the right edge of the piece, are two other patches in the same condition, one of them nearly three-quarters of an inch in long diameter, the other about a quarter of an inch. The general surface of the ileum between these patches and the ileo-cæcal valve is mottled with slate-color due to diffuse pigment deposits, and presents a large number of dark dots representing pigment deposits in the closed glands, which are so numerous in this region that perhaps the greater part of this discolored area may be described as an irregularly shaped Peyer's patch. In the cæcum a large portion of the surface is occupied by slate-gray streaks of diffuse pigmentation. The plate facing page 298, which represents the ileum in the case of Pierce, may be consulted as another illustration of the shaven-beard appearance, and the same may be said of the plate in Circular No. 6, facing page 116. Pigment deposits such as these are found in Peyer's patches which present no recognizable

* *Supra*, p. 298.

thickening, as well as in more or less thickened patches. In like manner they are found in solitary follicles of normal size as well as in those which are enlarged. Very often the deposit is found in both the solitary and the agminated glands, but not unfrequently the latter only are affected, more rarely the former alone.

*Lesions observed in the Large Intestine.*—The general description already given* of the appearances observed in inflammation of the intestinal mucous membrane applies, almost without modification, to those cases in which the inflammatory process is seated in the large intestine, and it is therefore unnecessary to repeat what was then said with regard to the characteristic changes of color and texture. Attention may, however, be drawn to the frequency with which the lesions found in any case are observed to be more pronounced in the cæcum and descending colon than in the intermediate tract, a circumstance which is also very noticeable in the case of follicular ulceration of the large intestine, as will be seen hereafter.

It will usually be observed, moreover, that when both the ileum and the large intestine are inflamed the process is further advanced in the latter than in the former, as though it had been seated primarily in the large intestine and only subsequently extended into the small. Thus mere reddened hyperæmic patches will often be found in the ileum, while in the cæcum and colon the slate-colored and greenish discolorations characteristic of chronic inflammation will be observed. Perhaps it is to some extent for this reason that in chronic cases the solitary glands of the colon are so much more frequently found ulcerated than those of the ileum; but I am inclined to believe, also, that the latter are more prone to ulcerate than the former, and that this is the chief reason why we so seldom encounter specimens in which the diseased solitary glands of the large intestine are as large as pin-heads without finding a tiny ulcer on the apex of each.

An inferior degree of enlargement of the solitary glands of the large intestine, in which, however, they attain twice their normal diameter, or even greater dimensions, is much more frequently to be met with; and that it is but seldom referred to in the autopsies in the last section must be explained by the fact that it is so easily overlooked. It has already been mentioned† that the enlarged solitary glands of the ileum are apt to project beyond the surface of the mucous membrane with constricted necks like tiny polypi; while in the large intestine the enlarged solitary glands are generally sessile. In fact, in the latter case the diseased glands find room up to a certain point to accommodate their increased bulk in the submucous connective tissue, which very often indeed increases in thickness while the closed glands are enlarging, so that glands as large even as pin-heads may produce only the most trifling elevation of the mucous membrane, and a smaller degree of enlargement may be quite invisible to the ordinary methods of investigation. When this is the case, however, the tumefaction of the closed glands can generally be detected at once by the unaided eye on examining the intestine by transmitted light, when the swollen glands become distinctly visible as minute opaque spots, while the surrounding tissue is quite translucent. In such cases it will often be found, on making perpendicular sections and examining them with a power of ten to twenty diameters, that the enlarged glands are three or four times their normal size. Unfortunately immersion in alcohol, by increasing the opacity of the intestinal walls, interferes with the distinctness with which the naked eye can recognize these moderate degrees of enlargement, and most of the specimens of this kind which were set aside at

* *Supra*, p. 296. † *Supra*, p. 297.

*Am. Photo-Relief Printing Co.,* *624 N. 24th St., Philadelphia*

TRANSVERSE COLON WITH ENLARGED GLANDS
ULCERATED AT THEIR APICES.

No 820. MEDICAL SECTION.

the Museum for permanent preservation speedily lost all value except as material for microscopic examination. For this reason I am unable to present a photographic illustration showing a moderate degree of enlargement of the solitary glands as seen by the naked eye, though a photograph of a thin section as seen with the microscope will be presented a little further on. I have, however, selected for photographic illustration a specimen in which the solitary glands are enlarged to the size of bird-shot, but in which a little ulcer has formed on the apex of each, although the patient had been sick but a few weeks. The case was one of typhoid fever accompanied by a smart catarrhal inflammation of the colon:

CASE 882.—Private George Hayes, company B, 12th U. S. infantry; age 25; was sent to the guard-house at Russell barracks, Washington, D. C., May 10, 1866. He continued under the charge of the guard, but apparently in excellent health, until about August 1st, when he came to sick-call suffering with diarrhœa, and was excused from fatigue duty. Assistant Surgeon E. Bentley, post surgeon at Russell barracks, states that he had not been on sick report at any time previously. The diarrhœa continued in spite of treatment, and soon after symptoms of typhoid fever were recognized, and the patient was sent to post hospital. Acting Assistant Surgeon George P. Hanawalt reports that he was admitted to the post hospital, Washington, D. C., August 25th. On admission he was found to be quite stupid, though he could readily be aroused. The following prescriptions were ordered: ℞. Nitro-muriatic acid one fluid drachm, water six fluid ounces. Take a tablespoonful every four hours, alternating with the following: ℞. Carbonate of ammonia one drachm, oil of turpentine two fluid drachms, powdered gum Arabic half a drachm, cinnamon-water six fluid ounces. Dose, a tablespoonful every four hours. Beef-tea. On the afternoon of the 26th he became delirious, and during the night constant watching and restraint were required to keep him in bed. This continued until the forenoon of the 27th, when almost complete loss of sensibility ensued. The patient could not swallow the milk-punch which had been ordered in the morning. An attempt was made to give him beef-tea, but a teaspoonful of it almost strangled him. Heavy stupor continued until noon on the 28th, when he died. *Autopsy:* The arachnoid at the base of the brain was opaque, and there was some effusion of lymph on the posterior portion of the spinal cord just below the medulla oblongata. All the viscera appeared healthy with the exception of the intestinal canal. The solitary glands of both large and small intestine were greatly enlarged and ulcerated at their apices, and there was considerable thickening and ulceration of the patches of Peyer. The intestinal canal was forwarded to the Army Medical Museum by Assistant Surgeon William Thomson, U. S. A., surgeon in charge of the post hospital.

Nos. 815 to 821, Medical Section, are from this case. Nos. 815, 816 and 817 are successive portions of the ileum, in which Peyer's patches are much thickened and ulcerated; the villi are greatly hypertrophied. In Nos. 815 and 816 the solitary glands are enlarged to rounded tumors, many of them as much as a fifth of an inch in diameter, or even larger, and some of them, especially in No. 816, ulcerated at their apices. In No. 817 the enlarged solitary glands have the same character, but are much less numerous. No. 818 consists of the last inch of the ileum, with the ileo-cæcal valve and cæcum. Both the ileum and cæcum present a number of enlarged solitary glands similar to those above described; those in the cæcum are ulcerated at their apices. No. 819 is from the ascending, No. 820 from the transverse, and No. 821 from the descending colon; all present enlarged solitary glands ulcerated at their apices, similar to those shown in the plate representing No. 820. These little tumors in No. 819 are smaller, in No. 821 larger, but in both less numerous than those in No. 820.

The plate facing page 306 is reproduced from a photograph of No. 820, which, as just mentioned, is a portion of the transverse colon from this case. The numerous enlarged glands vary from one-tenth to one-fifth of an inch in diameter, and project from the surface as small sessile tumors. The ulcers vary from little circular dot-like depressions to more irregular excavations one-tenth of an inch in diameter. The mucous membrane is nowhere ulcerated or abraded except on the summits of the enlarged glands.

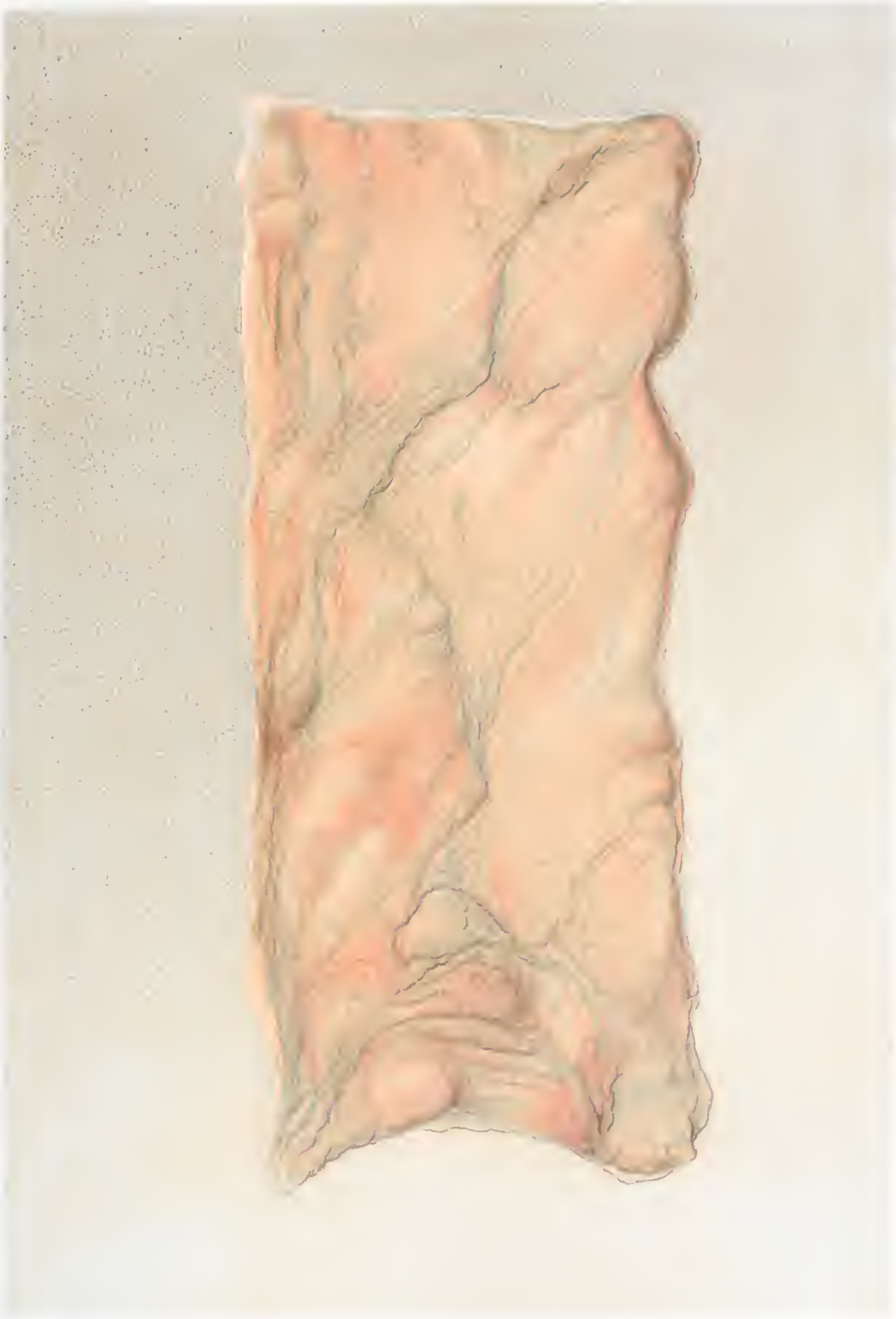
As this patient died of typhoid fever, the case might have been reserved for the chapter which treats of that disease to illustrate one variety of the intense catarrhal inflammation of the colon, which so frequently accompanies it; but I have preferred to

present it in this place, both because it differs only in the degree to which the glands are enlarged from the similar condition which occurs in simple acute diarrhœa, and because it illustrates the rapidity with which ulceration takes place when the solitary glands are enlarged in inflammations of the large intestine.

The pigment deposits encountered in the large intestine of those who have suffered from repeated attacks of acute diarrhœa, or from a protracted flux, may be seated as diffuse patches on the general surface of the mucous membrane, or may be more especially localized in the closed glands. The diffuse form of these deposits is more frequently encountered in the large than in the small intestine, and is apt to be more intense in the former, producing darker and more extensive discolorations; hence the ash and slate-colored, greenish and blackish streaks, which are so frequently observed in the cæcum, colon and rectum. The more localized deposits of pigment in the solitary glands are, on the other hand, less common in the large intestine than in the small; a circumstance which probably depends upon the fact that the ulcerative process, which it has been shown is so prone to occur in the large intestine, primarily destroys the centres of the closed glands, and therewith the usual seat of the pigment deposit. Still, cases are not infrequently observed in which the closed glands of the cæcum and descending colon, or even of the whole large intestine, are blackened with pigment, appearing as little blue-black dots about the size of grains of black pepper pretty plentifully scattered over the surface of the mucous membrane. Numerous examples of this condition might have been selected for pictorial representation; I have, however, preferred to reproduce a somewhat less frequent variety, which I have several times noticed, in which the central dot of pigment is surrounded by a tiny ring of the same color

Case 883.—Private Julius Zinke, company G, 98th Pennsylvania veteran volunteers; age 54; was mustered into service March 5, 1861, to serve three years. He had previously served out a three years' enlistment which had just expired. The register of the field hospital of the Second Division, Sixth Army Corps, reports him admitted November 23d; catarrh; returned to duty December 1st. It appears from the company muster-rolls, however, that he was again taken on sick-report and sent to general hospital in Washington, December 14th. It appears from the case-book of the Douglas hospital, Washington, D. C., that he was admitted to that hospital December 16, 1864, suffering with diarrhœa, said to be of a month's standing, and with some cough. The diarrhœa yielded to treatment, and he was furloughed, returning to hospital about April 1, 1865. At that time he stated that his diarrhœa was quite well, but that he suffered much pain in the region of the heart, running back to the angle of the scapula. He was somewhat short of breath, anæmic, and had a dry, hacking cough. The action of the heart was strong and rapid, and a murmur was distinctly heard coincident with the first sound; this murmur was so loud that it could be heard all over the region of the organ, which was evidently enlarged. He stated that he had suffered from trouble in the region of the heart for two years, during which time, however, he had been able to do duty in the field, carrying his knapsack. During the three weeks preceding his death he did not seem to suffer very much, but had a continual slight pain in the region of the heart, a short, dry cough and some dyspnœa; the action of the heart was rapid but regular. He was up and about the ward every day, and did not need to have his head very much elevated in order to sleep. On the morning of May 9th he was suddenly seized with a sort of spasm; his breathing became very short and spasmodic, and the action of the heart intermittent. This lasted for about half an hour, when he quietly expired. *Autopsy* fifteen hours after death: Rigor mortis well marked. The heart was somewhat enlarged. Just above the semilunar valves of the aorta there was an aneurismal sac capable of containing about two ounces of fluid. The sac had burst, the blood making its way between the middle and external coats of the aorta to a point a little above the left auricle, being prevented from communicating with the pericardial sac by a copious deposit of lymph, which, however, was so soft that it was torn during the examination, thus making the communication complete. The mitral valves were somewhat thickened and rough; the aortic valves large but healthy; the aorta slightly atheromatous. The pericardium was firmly adherent to nearly the whole surface of the heart and could be removed with difficulty. The apices of both lungs contained calcareous deposits and other indications of obsolete tubercle. The mucous membrane of the colon was somewhat softened; its solitary follicles all prominent and distinct, with a central spot of black pigment in each; just around each follicle was an areola of black pigment. The other organs were healthy. Acting Assistant Surgeon David L. Haight. The specimens were forwarded to the Museum by Assistant Surgeon Wm. F. Norris, U. S. A.

Nos. 516 and 517, Medical Section, Army Medical Museum, are from this case. No. 516 is the heart and a portion of the aorta, presenting the aneurism above described. No.



547 is a portion of the descending colon, in which, by transmitted light, a few of the solitary follicles can still be discerned in the alcoholic preparation as opaque spots; most of them, however, have become invisible to the naked eye.

The chromo-lithograph facing page 308 is from a water-color drawing representing the appearances presented by this piece of colon in the recent state; in the lettering of the plate the word dysentery has been erroneously used. The surface of the mucous membrane is salmon-colored, with greenish streaks due to diffuse pigment deposit. In many places the vessels can be discerned as delicate red arborizations. Each of the solitary glands is marked by a central dot of pigment surrounded by a little pigment ring. Nos. 642 to 650, Microscopical Section, are a series of perpendicular cuts of this colon, and will be described further on.

It will be observed that in this case the diarrhœa from which the patient had suffered had not troubled him for some time before death, so that the specimen represents a period when the inflammatory process was well advanced towards resolution. Doubtless slight anatomical lesions such as these—an undue degree of vascularity, abnormal pigmentation, and a moderate degree of enlargement of the closed glands—remaining behind after an attack of diarrhœa are among the conditions which render those who have suffered from that disease more liable to be again attacked, if exposed anew to the causes of the disease, than healthy persons under similar circumstances.

*Analysis of cases in which the lesions described above were observed.*—The number of cases recorded in Section III in which the large intestine only was the seat of the processes described is not large. In a few of the cases that appear to belong to this category the record shows that the small intestine was healthy, or at least not perceptibly diseased; as for example, cases 111, 118, 202, 324, 330, 361, 364, 386, 605, 749, 783 and 845. Of these some were of brief duration, as cases 111, 330 and 386; the others were more protracted. Case 783 was one of dysentery. Case 111 appears to have been one in which a very limited inflammation in the transverse and descending colon extended through the walls of the intestine to the peritoneal coat and involved a portion of the omentum. The symptoms are described as "resembling those of typhoid fever." Among the more protracted cases No. 202 may be particularly noticed. The patient had become much emaciated, and about ten days before death pus was recognized in the anterior chamber of the right eye. Nothing abnormal was observed in the small intestine except that the jejunum was discolored with bile. The large intestine was thin, its mucous membrane in regions congested and of a rich purple color.

In a small number of other cases, while the evidences of inflammation are recorded as having been observed in the large intestine, the condition of the mucous membrane of the small intestine is not mentioned, so that it must remain a matter of doubt whether this portion of the alimentary canal was affected. Cases 109, 136, 185, 305, 465, 480, 483, 493, 496, 503, 590, 635, 690, 694 and 796 belong to this category. Of these, cases 185 and 590 were examples of acute dysentery. In case 190 it is expressly stated that the large intestine only was examined. Case 465 is reported on the hospital register as one of "continued fever." In case 483 there was "great constriction and thickening of the large intestine at the sigmoid flexure, diminishing its calibre to about one-fourth its natural diameter." In case 493 the colon was contracted throughout its whole length to about half an inch in diameter.

But in the great majority of the cases included in Section III in which it is recorded that the large intestine was congested or inflamed without being ulcerated, the small intestine also, especially the ileum, was more or less extensively involved. I note altogether one hundred and twenty-five cases of this kind, viz: Cases 103, 113, 121, 124, 126, 128, 130, 131, 133, 135, 137, 144, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 162, 165, 170, 171, 172, 175, 177, 179, 209, 212, 217, 218, 222, 230, 232, 241, 280, 282, 287, 288, 294, 299, 303, 328, 331, 335, 337, 342,* 345, 347, 348, 352, 353, 359, 360, 366, 376, 377, 385, 397, 399, 412, 415, 419, 435, 442, 444, 445, 446, 460, 466, 473, 474, 479,† 489, 492, 494, 495, 497, 498, 512, 517, 525, 534, 537, 538, 544, 546, 547, 548, 551, 554, 556, 558, 562, 581, 583, 599, 603, 625, 639, 642, 644, 668, 672, 689, 692, 701, 716, 760, 761, 763, 776, 780, 785, 788, 797, 805 and 809.

Of these cases 121, 562, 780 and 805 were cases of acute dysentery. In some of the others, as for example, cases 103, 241, 328, 581, 639 and 776,‡ the histories clearly show that the diarrhœa had been of such duration that it must fairly be designated as acute. In others, as for example, cases 177, 218, 230, 232, 303, 360, 466, 473, 497, 556, 642 and 672, it is clearly shown by the record that the patient suffered from diarrhœa from five months to a year, or even longer, before death, so that the disease must undoubtedly be designated chronic. But in the majority of the cases, owing to the absence of any regimental record, the duration of the disease before the patient was admitted to general hospital cannot be ascertained, and it is therefore impossible to group all of them as acute and chronic, especially as no importance can be attached to the distinction between acute and chronic cases as recorded in the hospital registers, since patients who were very sick with any form of flux were commonly entered as suffering with chronic diarrhœa, without much inquiry into the actual duration of the disease; indeed the same was often done in the case of patients suffering with acute diphtheritic dysentery, if admitted during the third or fourth week of the disease, or later. It will be found, however, that in about three-fourths of the cases under consideration the recorded hospital history of the patient does not exceed three months; indeed, in rather more than half it does not exceed two months, varying from a few days to that period.

Among the autopsies embraced in this series are twenty-five by Professor Joseph Leidy, of the University of Pennsylvania, in cases of the so-called Chickahominy diarrhœa. To this group belong cases 124, 126, 128, 130, 131, 133, 135, 137, 144, 146,§ 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 162 and 175. The patients were almost all admitted to Satterlee hospital, West Philadelphia, from the Army of the Potomac at Harrison's Landing, Virginia, on or about August 10, 1862, and died at various periods, from a few days to two or three months subsequently, with the exception of case 162, in which life was protracted to four months, and case 175, in which the patient survived rather more than six months after admission to hospital. In most of these cases the

* In case 342 the existence of ulcers in the small intestine, especially in Peyer's patches, is recorded. I understand from the description that these were similar to those represented in the plate facing p. 302.

† In case 479 it is also stated that the lower part of the ileum was coated with "a puruloid exudation," probably merely muco-pus.

‡ Case 776 is one of considerable interest. The patient is reported to have suffered from typhoid (?) fever followed by rheumatism and debility. Three months after his first admission to hospital, and during the month preceding his death, he had several more or less imperfect paroxysms of what was supposed to be intermittent fever, for which quinine was rather freely administered. During the night preceding his death he was attacked with diarrhœa, and died suddenly next day. Since the case was put in print in this work (see p. 240 *supra*) my attention has been called to the fact that the reporter, Dr. H. M. Lyman, has published it elsewhere as a case of congestive fever. (American Med. Times, August, 1862, Vol. V, p. 110.) I am not disposed to dispute this view of the case, but the interest of the autopsy in connection with sharp diarrhœa of brief duration is not thereby diminished.

§ In case 146, which resembles the rest of the series in its general features, it is stated that one of the inflamed patches of the ileum, about three inches long, was gangrenous, the gangrene extending to the peritonæum.

length of time the patient had been ill before reaching Satterlee hospital is not recorded. The exceptions are cases 147, 153, 158 and 159. In case 147, the regimental records show that the patient was taken sick with "fever" June 3d; was treated in division hospital, convalesced, and was returned to his regiment, where he was again taken on sick-report July 6th, the diagnosis this time being scurvy; the date at which his diarrhœa commenced, however, is not recorded. In case 153, the regimental records show that the man was first taken on sick-report with diarrhœa about two weeks before his admission to Satterlee hospital. In case 158 the regimental records represent the patient as first taken on sick-report with diarrhœa July 31st; August 5th, the diagnosis "remittent fever and incipient scurvy" is recorded, and August 10th he was admitted to Satterlee hospital. In case 159, the regimental records represent the patient as excused from drill July 24th, and taken on sick-report with diarrhœa July 29th. He was admitted to Satterlee hospital August 10th. These examples show that a portion at least of the cases under consideration had been sick but a short time before they reached Satterlee hospital; others no doubt had suffered with diarrhœa for several weeks or even longer before they were sent away from Harrison's Landing, so that the series represents cases of various duration from a few weeks to more than six months. The relation of these cases to malarial fever, indicated by the record of Nos. 147 and 158, will be discussed in a subsequent chapter.

It is to be remarked that the term Chickahominy diarrhœa, as used at the time, embraced not merely such cases as those above referred to, but all the forms of flux, including chronic cases, which had progressed to thickening and follicular ulceration of the colon, as well as cases in which the diphtheritic dysenteric process was developed before death, and cases complicated with ordinary enteric fever. This is well illustrated by the autopsies made by Professor Leidy on the bodies of diarrhœa patients admitted to Satterlee hospital from Harrison's Landing at the same time as those enumerated above. Thus, case 134 is characterized by well-marked thickening and follicular ulceration of the colon, while cases 138, 139, 140, 142 and 145 represent transition forms between this condition and that just described. Cases 132, 143, 160 and 161 are instances in which the diphtheritic process was developed in the colon with more or less intensity, and in case 141, besides colon ulcers such as occur in diphtheritic dysentery, the ulceration of Peyer's patches characteristic of enteric fever was observed. Nevertheless, if we may form a judgment from Professor Leidy's autopsies, it must be admitted that in the majority of the Chickahominy cases the inflammation of the intestinal mucous membrane did not progress to the stage of ulceration.

It must, however, be remarked further that cases quite similar to these occurred, not only in the Army of the Potomac after it left the Peninsula, but in the other armies also, in all parts of the country and at every period of the war. Professor Leidy himself has contributed several interesting autopsies—cases 165, 170, 171 and 172—on patients sent to Satterlee hospital from the Army of the Potomac after it left the Peninsula, in which the lesions observed were quite similar to what was found in the Chickahominy cases.

This general distribution of the class of cases under consideration gives additional value to Professor Leidy's autopsies, which constitute by far the most important contribution to the pathological anatomy of the non-ulcerative form of intestinal inflammation made during the war. But a number of excellent observations of similar character have also been contributed by other medical officers. Thus, Assistant Surgeons George M. McGill and Har-

rison Allen, U. S. A., have each reported several well-observed cases from Lincoln hospital, and individual cases of a similar character, reported by various medical officers, will be found among those enumerated above as belonging to the group under consideration. Unfortunately, in very many of the cases included in this group the autopsies were very imperfectly recorded, but it is hoped that, imperfect as they are, they will serve to indicate the comparative frequency of fatal cases of diarrhœa without ulceration.*

In some of these imperfectly recorded cases it is merely stated that the mucous membrane of more or less of the small and large intestines was congested, as in cases 103, 113, 209, 412, 534, 547, 558, 583, 625 and 668; congested and softened, as in cases 287, 466, 603, 689 and 692; congested and thickened, as in cases 121, 218, 294, 397 and 809; or congested and contracted, as in cases 212 and 217. In other cases it is simply recorded, without further detail, that the mucous membrane was inflamed, as in cases 124, 179, 241, 328, 442, 446, 538, 546, 548, 551, 554, 556, 760 and 797; inflamed and softened, as in cases 299, 473, 474, 672 and 761; inflamed and thickened, as in cases 177, 444 and 544; or inflamed, softened and thickened, as in cases 280, 435 and 805.

* Corroborative testimony will be found in most of the few accounts of the appearances observed in the fatal cases of camp diarrhœa which were published in the American medical journals during the civil war. Thus, ALONZO CLARK is reported—American Medical Times, May, 1863, p. 210—to have exhibited to the New York Pathological Society, November 26, 1862, several specimens of intestines from soldiers who had died in Bellevue hospital of chronic diarrhœa contracted in Virginia. "When the first cases of this diarrhœa had presented themselves, he expected to find the same lesions after death which had characterized the chronic diarrhœa contracted by our soldiers during the Mexican war, viz., ulcerations of the mucous membrane. He was, however, very much surprised to find that such was not the case. The mucous membrane, in the majority of instances, presented an abraded appearance, as if an acid matter had been applied with a brush, only removing the epithelial scales. All the intestines examined gave an irregular and extraordinarily red injection, and in several instances there had been observed spots of ecchymosis in the colon. In one specimen there were noticed slight ulcerations in the mucous membrane of the large intestine, mostly in its upper portion, each spot being surrounded by a layer of lymph." He had made ten autopsies, and promised further details at a subsequent meeting. These particulars were communicated to the same society in December—The Medical and Surgical Reporter, January, 1863, p. 312. Eleven autopsies were now reported. In five of them no ulceration was found in any part of the intestinal canal. In these cases "the mucous membrane was thinned as by an acid; congestion was abundant, not of an arborescent, but of an ecchymosed appearance." In one of the six remaining cases there were a few ulcers near the rectum; in another, a few near the upper extremity of the colon. "The ulcers vary in degree, but in none of them are they very numerous. Some of them presented spaces overspread with lymphy matter. In these cases there was no ulceration, but the follicles presented dark spots giving a mottled appearance. The mesenteric glands are enlarged in all the cases. Peyer's patches are elevated and mottled over with dark spots, so that the mucous membrane presents a grayish appearance." These results are very similar to those which LEIDY had previously obtained in Philadelphia. I regret that Dr. CLARK has not published his observations in detail. They are not contained in the *Transactions of the New York Pathological Society*, Vol. I, New York, 1876. HENRY W. COOKE, house physician, Bellevue hospital, in the following February, published—*The Diarrhœa of Soldiers*, American Medical Times, February, 1863, p. 102—some additional observations, in which, however, those reported previously by CLARK appear to be included. Of 132 cases of this disease admitted October 3 and 5, 1862, 45 had proved fatal, and 17 autopsies had been made. "The duodenum and upper portion of the jejunum have usually been healthy, occasionally more or less congested. The inferior portion of the jejunum and all the ileum have, without exception, presented tracts of congestion at irregular intervals, varying in number and intensity; frequently points of extravasation were presented, but never of ulceration. Peyer's glands have been found invariably enlarged and thickened, of a grey color, the free surface presenting innumerable minute black points, each of which appeared to mark the situation of a diseased glandule. The mesenteric glands have, without exception, been found enlarged and prominent. The lesions of the large intestines have been either those of congestion, with varying degrees of extravasation or of ulceration, more or less extensive. The colon in the former cases has invariably presented patches of intense congestion, and in numerous instances extravasation, the amount and intensity varying in different subjects; in a few, the whole mucous surface of the intestine having a livid red color, in others, tracts of more or less intense congestion, at irregular intervals, as in the small intestines, would be noticed. The ileo-cæcal valve almost invariably presented intense congestion. The rectum has uniformly presented intense congestion, with more or less fibrinous exudation. Frequently the presence of fibrinous exudation was a question of doubt." Then follows a description of the cases in which ulceration was present, to which I shall recur hereafter, followed by the remark: "Of the seventeen examinations made, seven were more or less freely ulcerated, the remaining ten presented no ulcers." Surgeon J. R. BLACK, 113th Ohio volunteers, writes to The Cincinnati Lancet and Observer, Vol. VI, 1863, p. 424, that in a number of fatal cases of camp diarrhœa in General C. C. Gilbert's Division, Army of Kentucky, the ileum and colon always gave evidences of active inflammation, but "I have seen no ulceration." Assistant Surgeon D. A. WENDELL—*Post-mortem examinations of Cases reported on the monthly report of sick and wounded at Base hospital, 18th Army Corps, for the month of July*, 1864. Communicated by Assistant Surgeon C. E. MUNN, 27th Massachusetts volunteers, Boston Medical and Surgical Journal, Vol. LXXI, 1864, p. 113—reports the post mortem of private Daniel Jackson, company K, 5th U. S. colored troops, who died of camp diarrhœa. On opening the abdomen evidences of peritonitis were observed. The mucous membrane of "the cæcum, colon and three feet of the ileum were inflamed. No ulceration was discovered, but the mucous membrane in the region of the cæcum, about twelve inches either way, was found congested and thickened. About twelve inches of the rectum was also much inflamed. The mesenteric glands and the glands of the colon were somewhat enlarged." This case was reported to the Surgeon General's Office, together with a number of other autopsies, chiefly surgical, by Surgeon H. B. Fowler, 12th New Hampshire volunteers, in charge of the hospital, in a sub-report to his monthly report of sick and wounded for July, 1864. This sub-report was filed in the Surgical Section of the office, and the case was hence overlooked in preparing Section III. Surgeon GEORGE D. WINCH, 42d Wisconsin volunteers—*Chronic Diarrhœa*, Chicago Medical Journal, Vol. XXII, 1865, p. 344—relating his experience with this disease during the war, says that he never found the stomach diminished in size even in protracted cases, its mucous membrane was generally dark-red, but seldom softened or ulcerated. The duodenum and jejunum sometimes exhibit inflammatory appearances, but generally nothing decisive. In the ileum these appearances increase in intensity from the beginning to the ileo-cæcal valve. "The mucous membrane is of a dark or reddish-brown color and thickened. The vessels seemingly injected to their utmost fulness. The solitary follicles and agminated glands participate in the enlargement; but we have not succeeded in finding ulcers." The mucous membrane of the colon is of "a dark-red color, thickened, the solitary follicles enlarged. In some cases there is no ulceration to be found, and I confess I cannot diagnose this class from those in which on examination are found large ragged ulcers." In the majority of his cases, however, he found the colon ulcerated. Fatty liver was common; the kidneys in some cases enlarged and bloodless; the mesenteric glands were enlarged. The pericardium often contained from two to four ounces of fluid.

Even among the cases in which the appearances of the intestinal mucous membrane are more definitely characterized, all mention of the condition of the closed glands is very frequently omitted; so that the number of instances in which it is recorded that the closed glands were enlarged, or contained pigment deposits, or presented both these conditions, cannot be regarded as in any way indicating the comparative frequency with which these glands were thus affected. Moreover, as disease of the closed glands of the colon, when it does not progress far enough to produce ulceration, is usually less conspicuous than the similar lesion in the small intestine, it is not surprising that the latter was more frequently recorded than the former.

I note that in cases 131, 165 and 342 it is stated that the solitary glands in both large and small intestines, and the glands of Peyer in the latter, were enlarged; in cases 148, 222, 517 and 537, that the solitary glands were enlarged in both large and small intestines; in case 776, enlargement of the solitary glands in the large intestine only is recorded; the enlargement of the glands of Peyer and the solitary glands of the small intestine in cases 133, 172, 348 and 377; of the solitary glands of the small intestine only, in cases 126, 150, 153, 154, 155, 157, 162, 335, 347, 359, 492, 639 and 644; of Peyer's glands only, in cases 147 and 353. In cases 126, 147, 148 and 342 the enlargement was associated with deposits of pigment in the closed glands. Pigment deposits in the closed glands were also found in a number of cases in which no enlargement of the glands is recorded. It is stated that these deposits existed in the glands of Peyer as well as in the solitary glands of both large and small intestines in cases 130, 135, 137, 144, 153, 156 and 170; in the glands of Peyer only, in cases 159, 335 and 366; in the glands of Peyer and solitary glands of the small intestine, in case 151; in the glands of Peyer and solitary glands of the large intestine, in cases 128, 150, 155, 158, 162 and 175, and in the solitary glands of the large intestine only, in cases 149 and 154. I may note in this connection cases 342 and 347, both observed by Assistant Surgeon George M. McGill, U. S. A., in which it is recorded that the duodenal glands were somewhat enlarged. It is not clear, however, from the record in these cases, whether the reporter intended to indicate the racemose glands of the duodenum, or whether his attention was merely directed to an enlargement of the closed glands, which exist here as well as in other parts of the small intestine.

In some of the cases it is recorded that the diseased large intestine was contracted so as to be diminished in calibre, as for example, in cases 152, 156, 171, 377, 415, 489 and 492; in a few others the same condition is stated to exist in the intestines generally, as in cases 157, 232, 331, 494 and 498. In some of these cases, as in 331, 415, 489, 494 and 498, it is stated that the walls of the contracted intestine were thickened. The process by which the intestine becomes thickened and contracted will be described hereafter in connection with the chronic cases. It very generally results from a hyperplasia of the submucous connective tissue, which is usually, but not always, associated with ulceration of the solitary glands when it affects the large intestine.

Intussusceptions of the small intestine are recorded in several of these autopsies, as in cases 156, 157, 185, 494 and 639. In some instances a single intussusception was observed, in others several—(three in case 494, four in case 156.) They were not attended by any evidences of strangulation of the intestines or of local peritonitis, and are probably to be regarded simply as phenomena of the agony.

Besides cases 111 and 146, in which, as already mentioned,* the inflammation, for an area of a few inches, involved all the coats of the intestine, including the peritonæum, evidences of general *peritonitis* were occasionally observed, as in cases 171, 209, 241, 415 and 760. There were also a few instances in which it is recorded that the abdominal cavity contained more or less serum, as in cases 222, 554 and 809. Peritoneal adhesions, the result of former local peritonitis, were observed between the convex surface of the right lobe of the liver and the diaphragm in cases 137, 144 and 785; similar adhesions between the convex surface of the spleen and the parietal peritonæum in case 130. In case 554, (a colored soldier,) extensive tubercular disease of the *omentum* is recorded.

In fatal cases of diarrhœa, produced by the intestinal lesions just described, it very often happens that no lesion of the *stomach* can be recognized after death. Not unfrequently, however, this organ is involved in the catarrhal process, and evidences of hyperæmia, or of acute or chronic inflammation, such as punctiform or uniform redness, or other discoloration, with or without softening, thickening, &c., were observed. Thus the stomach is spoken of in some of the autopsies as being more or less extensively congested, as in cases 282, 347, 348, 352, 361, 445 and 809; congested and softened, as in cases 287, 345 and 353; inflamed to a greater or less extent, as in cases 133, 144, 146, 147, 149, 151, 152, 158, 177, 512, 556, 716, 749 and 805; inflamed and softened, as in cases 148, 150, 153 and 761; inflamed, softened and thickened, as in case 280; or even ulcerated, as in cases 551, 785 and possibly 605. There are also a few instances, as cases 294, 399, 465, 474 and 496, in which the stomach is simply spoken of as softened; but in view of the frequent occurrence of softening as a post mortem change in this organ, no great importance can be attributed to these observations.

*Lesions observed in other organs.*†—Although in many of the autopsies just discussed the lesions existing in other organs than the alimentary canal are not related with satisfactory detail, still enough has been recorded to furnish some interesting testimony with regard to the more frequent and more important complications. The cadaver was usually emaciated to a degree which varied with the duration of the disease and the severity of the symptoms. In the more protracted cases the emaciation was often extreme. Purpura-like blotches were occasionally observed on the skin of the trunk and extremities. From my own personal observations, as well as the verbal testimony of others, I am satisfied that they existed much oftener than would appear from the record.

The cranial cavity was very frequently not opened, but, when examined, the *brain* was generally found to be healthy. Occasionally the quantity of subarachnoidal fluid was greater than normal, as in cases 412 and 776; or the meninges appeared to be more or less congested, as in cases 202, 347, 348, 353, 460 and 761. In cases 175 and 415 meningitis was observed; in case 337 a small quantity of pus was found in the ventricles of the brain.

In case 359, observed by Assistant Surgeon Harrison Allen, U. S. A., suppuration of both *parotid glands* was observed; this case had been regarded as one of typhoid fever, but after death only the characteristic evidences of catarrhal inflammation of the mucous membrane of the ileum and large intestine were observed, and "Peyer's patches were normal."

* See pp. 309 and 310.

† The following remarks refer to the more important lesions recorded in one hundred and fifty-six autopsies of non-ulcerative inflammation of the mucous membrane of the intestinal canal, viz: Those enumerated on pages 309 and 310, and four of those selected for pictorial illustration, viz: Cases 879, 880, 881 and 883. Case 882 is not included, partly because of the existence of numerous ulcers, but chiefly because the case is one of undoubted typhoid fever.

The *respiratory organs* were very generally examined and were frequently the seat of some intercurrent inflammation. Occasionally diphtheria was the immediate cause of the fatal issue, as in cases 152, 170, 377 and 386. Bronchitis was a much more frequent complication; but doubtless the evidences of this inflammation frequently escaped observation, and the number of instances in which the record shows that simple bronchitis existed is comparatively small. Cases 361, 361, 415, 419 and 760 may be cited as examples. Intercurrent pneumonia and pleuropneumonia, if not of more frequent occurrence, were at least more frequently recognized during the autopsies. Thus it appears that pneumonia of the right lung existed in cases 136, 137, 175, 303, 446, 460, 692, 761, 796 and 809; of the left lung, in cases 230, 282, 330, 348, 517 and 583; of both lungs, in cases 149, 202, 209, 352, 360, 376, 385, 412, 581, 635, 639, 879 and 880. Pleuropneumonia of the right lung was observed in cases 155, 445 and 503; of the left lung, in cases 150, 217 and 716; of both lungs, in cases 162, 165, 353, 377, 399, 672* and 749. In a few of these cases the record clearly shows the presence of lobar (croupous) pneumonia in the stage of red or gray hepatization; in others it is equally clear that lobular pneumonia was present; but in many of the cases it is not possible to decide from the record what form of lung inflammation existed.

Œdema of one or both lungs was noticed in cases 157, 366 and 763. In case 337, the lower lobe of the right lung presented "a number of small irregular vomicæ containing a puruloid fluid," and the right pleural sac contained "about a pint of dirty yellowish liquid." More or less extensive tubercular disease of the lungs, with or without intercurrent pneumonia, or pleurisy, was found in a number of cases. The right lung only, appears to have been involved in cases 103, 158, 212, 291, 359, 525, 556, 605, 642 and 690; the left lung only, in cases 232, 397, and 446; both lungs in 113, 151, 172, 331, 345, 495, 534, 537, 538, 548 and 644. In case 525, which is in several respects a peculiar one, the posterior part of the cricoid cartilage was necrosed and surrounded by a collection of pus.

Pleurisy, without pneumonia or tubercular disease of the lungs, was not a very frequent complication, but was occasionally encountered, as in case 625, in which "both pleural sacs contained serum mixed with pus, and a large amount of pus adhered to the surface of the lungs," and in cases 222 and 554, in each of which the right lung was compressed by a large quantity of serum accumulated in the right pleural sac. In very many of the cases, however, the existence of pleuritic adhesions is recorded.

The *heart* did not usually present any very marked abnormity. It is occasionally spoken of as very small, as in cases 217, 460, 512 and 625; small, as in cases 605 and 797; soft and small, as in case 534; wasted, case 149; pale, case 359; pale and flaccid, case 113; pale and flabby, case 209; flabby, cases 150, 172 and 558; soft and flabby, case 809; large and flabby, case 788; enlarged and fatty, case 689. These expressions would appear to indicate the existence, in some cases, of a more or less pronounced atrophic condition of the organ, and should be considered in connection with the cardiac debility often observed during life, especially in chronic cases.

Valvular disease of the heart was occasionally observed, as in cases 158, 280, 625, 785 and 788. In all these examples the mitral valve was either exclusively or chiefly affected. In three of them—158, 785 and 788—there was effusion of serum into the pericardium. In case 883 there was an aneurism of the aorta.

* In case 672 both pleural cavities contained serum and pus and the right lung was hepatized, but the condition of the left lung is not stated.

In a number of other instances the *pericardium* contained serum either alone or admixed with lymph or pus. The quantity varied from two ounces to a teacupful or even more. Cases 113, 137, 162, 172, 282, 288, 347, 348, 558, 694 and 776 may be cited as examples; and it may be remarked that those in which the existence of pericarditis is clearly indicated, as by the admixture of pus or lymph, were all associated with pneumonia, pleurisy, or both.

Fibrinous *heart clots*, with or without an admixture of ordinary coagula, were observed in a considerable number of instances, as in cases 118, 144, 147, 150, 153, 155, 158, 159, 162, 172, 179, 202, 212, 330, 337, 347, 348, 352, 353, 360, 364, 376, 377, 385, 386, 399, 412, 525, 603, 642, 749 and 776. The clots are spoken of as in the left cavities only in three cases; in the right cavities in nine; in the cavities of both sides in seventeen. In three cases it is not stated whether the clots were on one side or both. The presence of heart clots is also recorded in both sides of the heart in cases 177, 445 and 605, and in the right side only in case 644, without any indication of the character of the clot being recorded.

The *liver* did not usually present any very conspicuous lesion. It is sometimes spoken of as congested, or full of blood, as in cases 113, 202, 282, 328, 347, 377, 385, 415, 419, 503, 599, 644, 672 and 776; sometimes as enlarged, or large, as in cases 165, 175, 241, 280, 303, 353, 399, 525 and 716; sometimes as more or less fatty, as in cases 170, 179, 287, 692, 749, 760 and 763; or as presenting the nutmeg appearance, as in cases 230, 337, 348 and 360. In cases 131 and 153 it is described by Dr. Leidy as "rat liver." In case 345, the liver is said to have contained tubercles; in case 151, several white, firm, fibro-plastic tumors the size of shell-barks. In case 171 there were two multilocular abscesses of the liver, a large one in the right lobe, a smaller one in the left; there is no record that this patient had diarrhœa, the diagnosis in the hospital register being intermittent fever, but evidences of intestinal catarrh were observed in both ileum and colon by Dr. Leidy.

In the majority of the autopsies no mention is made of the contents of the *gall-bladder*, and in about half the cases in which this point is alluded to the record refers merely to the quantity of bile. Thus the gall-bladder is spoken of sometimes as full, or distended, as in cases 121, 151, 154, 157, 158, 280, 287, 466, 603, 639, 668 and 880; or a smaller quantity is indicated, from "very little" to an ounce and a half, as in cases 360, 366, 386, 446, 460 and 785. The appearance of the bile is indicated in a few cases: Thus, it is spoken of as resembling tar, in cases 171, 635 and 845; dark and tenacious, in case 359; very dark, in cases 361 and 445; dark-green, in cases 347 and 377; yellowish-green, in case 776; yellowish, in case 202; straw-colored, in case 353; ochre-colored, in case 361; brownish and flocculent, in case 376; mucous and viscid, in case 146; light-colored and watery, in cases 337 and 345. In case 348 the gall-bladder was empty. These descriptions are not very definite, but they will serve to show the absence of any constant peculiarity of the biliary secretion in these cases.

The *spleen* was apparently normal in the majority of the cases. In a number of instances, however, it was preternaturally small, and in about an equal number enlarged. Thus, it is spoken of as small in cases 155, 156, 157, 158, 171, 177, 282, 324, 517, 525 and 785, and an abnormally small weight is specified in several other cases, as four ounces and three-quarters in case 377, four ounces in case 348, three ounces and a quarter in case 345, three ounces in cases 359 and 749, two ounces and three-quarters in case 347, and ten

drachms and a half in case 551. On the other hand it is spoken of as enlarged in cases 113, 151, 222, 211, 465 and 466; about twice its natural size in cases 474 and 716. Sometimes the dimensions given show the degree of enlargement, as six inches by four, in case 361; seven inches by five and a quarter by three and a half, in case 385; seven inches and a half by five by three, in case 165. Sometimes the enlargement is indicated by the weight, which, in case 805, was ten ounces; in case 376, ten and a half; in cases 288 and 809, eleven; in case 386, twelve; in case 761, fourteen; in case 353, fifteen, and in case 763, eighteen ounces.

The *mesenteric glands* are spoken of in a number of cases as enlarged. In some of these instances tubercles existed in the lungs, and the mesenteric glands are described as tubercular or cheesy; cases 212, 331, 537, 605 and 644 are examples. In others, in which also the lungs were tubercular, the mesenteric glands are simply said to have been enlarged, as in cases 151, 525, 534, 538 and 642. There were, however, a number of instances in which the mesenteric glands were more or less enlarged although the lungs were free from tubercles, as cases 121, 126, 131, 157, 159, 328, 479, 498, 635, 639, 716, 749, 760, 763 and 845. Doubtless a certain amount of enlargement would have been more frequently observed in these glands had their condition been invariably ascertained and recorded; but in most of the autopsies they are not alluded to.

The *kidneys*, in the majority of the cases, presented no recognizable abnormity. In a few instances they are described as fatty, as in cases 150, 175, 212 and 397. In the latter case the right kidney weighed seven ounces and a half, the left eight and a half. The weight of the kidneys is given in a number of instances, and in cases 202, 288, 352, 359, 360, 581, 760 and 761 one or both kidneys weighed from eight to nine ounces. It is very probable that some at least of these large kidneys were fatty, and the same probability exists with regard to such cases as 157 and 280, in which the kidneys are spoken of as large and pale. In cases 525, 547 and 701 the kidneys are spoken of as granular, but the term appears to have been loosely used. In case 668 the kidneys are spoken of as inflamed.

Pathological Histology of the Inflamed Intestines.—The interpretation of the minute changes observable in the inflamed intestines presupposes, of course, an acquaintance with the histology of the normal intestine. For the details of this subject the reader must be referred to the treatises on histology;* yet there are certain points to which it appears desirable to allude in this place.

* Among which I may indicate A. Kölliker—*Mikroskopische Anatomie*, Bd. II, *Specielle Gewebelehre*, Leipzig, 1850–54; also *Manual of Human Microscopic Anatomy*, London, 1860; J. Henle—*Handbuch der systematischen Anatomie des Menschen*, Bd. II, *Eingeweidelehre*, Braunschweig, 1866; S. Stricker—*Handbuch der Lehre von den Geweben des Menschen und der Thiere*, Leipzig, 1868–72; H. Frey—*Handbuch der Histologie und Histochemie des Menschen*, 2te Aufl., Leipsig, 1867; also English transl. of 1st ed., London, 1864. See also the essay of Herbert Watney—*The minute anatomy of the alimentary canal*, Philosophical Transactions, Vol. 166, Part 2, London, 1877, p. 451, with 5 plates containing 43 figures, and an excellent bibliography. Abstracts will be found in the London Med. Record, March 24, 1875, p. 177 Proc. Royal Soc., April, 1874; Centralblatt für die med. Wiss., 1874, No. 48; and Quarterly Journal of Microscopical Science, July, 1877, p. 213 and Plate XV. Copious references to the older literature of the anatomy of the stomach and intestinal canal are given by A. Haller—*Elementa Physiologiæ Corporis Humani*, T. VI, Lausanne, 1777, Lib. XIX, Sect. I, p. 108; T. VII, 1778, Lib. XXIV, p. 1 *et seq.* As especially noteworthy in connection with our subject, I may single out, however the essays of J. C. Peyer—*De glandulis intestinorum*, [1677:] I cite from the Bibl. Anat. of Mangetus, T. I, Geneva, 1685, p. 111 *et seq.*; J. C. Brunner—*Novarum glandularum intestinalium descriptio*, Ephemer. Med.-Phys. German., Dec. II, Ann. 5, 1686, Obs. 241, p. 464; also *De Glandulis in Duodeno Intestino Detectis*, Heidelberg, 1687: I have not obtained access to this work; J. N. Lieberkühn—*Diss. de fabrica et actione villorum intestinorum tenuium hominis*, Leyden, 1745, with three copper plates. The glands which bear his name are described in § 10. Among the numerous special treatises, besides those to be mentioned hereafter, I have consulted the following with interest: J. Döllinger—*De vasis sanguiferis quæ villis intestinorum tenuium hominis brutorumque insunt*, Munich, 1828; Karl A. Rudolphi—*Einige Beobachtungen über die Darmzotten*, Reil's Archiv f. die Physiologie, Bd. IV, [1800,] S. 63 and 339; L. Boehm—*Diss. de glandularum intestinalium structura penitiori*, Berlin, 1835, (two plates.) J. Henle—*Symbolæ ad anatomiam villorum intestinalium*, Berlin, 1837, (one plate.) C. Krause—*Vermischte Beobachtungen und Bemerkungen*, Müller's Archiv, 1837, S. 7, on the intestinal glands. J. Berres—*Anatomia Microscopica Corporis Humani*, Vienna, 1837 Tab. 20–22, (injected vessels;) John Goodsir—*On the structure of the intestinal villi in man and certain of the mammalia, &c.*, Edinburgh New Philosophical Journal, Vol. XXXIII, 1842, page 165, (one

*Remarks on certain points in the histology of the normal intestines.*—One of these is the structure of the peculiar tissue which forms the proper substance of the mucous membrane, uniting together the glands of Lieberkühn * (tubular glands) in both large and small intestine, and constituting also in the latter the parenchyma of the villi. This tissue, for which His† has proposed the name adenoid tissue, on account of its resemblance to the substance of the lymphatic glands, consists of a network or reticulum of stellate cells, the meshes of which are filled with round, delicately granular cells resembling those of the lymphatic glands or the white corpuscles of the blood. In thin sections the latter elements are usually so numerous as to obscure the reticulum, unless they are first pencilled away with a brush, when the meshes of the reticulum come into view. The bloodvessels and lymphatic sinuses of the villi, and the rich network of blood and lymph capillaries between the glands of Lieberkühn, lie in the substance of this adenoid tissue.

The mucous membrane is separated from the submucous connective tissue by a delicate muscular layer less than the thousandth‡ of an inch thick, which extends from the stomach throughout both small and large intestine. This layer, which is known as the muscle of the mucous membrane, or the muscle of Brücke,§ is composed of unstriped muscular fibre-cells, and, like the proper muscular coat of the intestine, consists of two laminæ—an internal, the fibre-cells of which are disposed circularly, and an external, composed of longitudinal fibres. These two laminæ are of nearly equal thickness. The inner, or circular one, gives off great numbers of delicate processes, which run between the glands of Lieberkühn, in both small and large intestine, towards the surface of the mucous membrane. In the small intestine similar but rather stronger muscular processes are given off, which enter the parenchyma of the villi and form in each a muscular sheath around the central lymph-sinus; and there is also a more superficial layer of muscular fibre-cells in the peripheral portion of the parenchyma of the larger villi of the duodenum and upper portion of the jejunum.‖

The submucous connective tissue occupies the space between the longitudinal layer of the muscle of Brücke and the circular layer of the proper muscular coat of the intestine. It consists of a delicate fibrillated matrix with branching, often stellate cells, the processes of which appear to anastomose, and contains also a considerable number of delicate elastic fibres. The branching cells form an irregular reticulum, the meshes of which are smaller in the immediate neighborhood of the muscle of Brücke than in any other part of the

plate;) see also *Anatomical Memoirs of John Goodsir*, Edinburgh, 1868, Vol. II, p. 393; A. E. LACAUCHIE—*Études hydrotomiques et micrographiques*, 1re Mémoire, Paris, 1844, (four plates;) L. MANDL—*Anatomie Microscopique*, T. I, p. 325, Mémoire sur la structure intime des membranes muqueuses et des organes digestifs, Paris, 1847, (with two plates, 37 and 38, and bibliography;) C. HANDFIELD JONES—*Some observations on the intestinal mucous membrane*, London Medical Gazette, Vol. VII, [1848,] p. 835; A. KUHN—*Untersuch. und Beob. aus dem Gebiete der Anatomie, Physiologie und practischen Medicin*, Heft 1, Heidelberg, 1849, S. 8, Ueber die Anfänge der Saugadern in den Darmzotten, (Tab. VI, Fig. 1–15;) R. O. ZIEGLER—*Ueber die solitären und Peyer'schen Follikel*, Würzburg, 1850; C. J. M. LANGENBECK—*Mikroskopisch-Anatomische Abbildungen*, Göttingen, 1850, Lief. III and IV; F. ERNST—*Diss. über die Anordnung der Blutgefässe in den Darmhäuten*, Zurich, 1851; see also the account of the anatomy of the stomach and intestines, in the work of R. B. TODD and WM. BOWMAN—*The Physiological Anatomy and Physiology of Man*, London, 1856, Vol. II, pp. 190 and 216.

* GALEATI—*De cribriformi intestinorum tunica*, Comment Bonon, Vol. I, 1731. I have not seen this paper, and quote from MANDL, *op. cit.*—was probably the original discoverer of these tubular glands. According to LACAUCHIE, [*op. cit.*, p. 38,] he succeeded in observing them by imbibing the intestine with ink, and represented in a figure, which this author has reproduced, [Plate II, Fig. 4,] the peculiar manner in which they are arranged around the solitary glands of the large intestine.

† W. HIS—*Untersuchungen über den Bau der Peyer'schen Drüsen und der Darmschleimhaut*, Leipzig, 1862.

‡ According to HENLE, *op. cit.*, p. 163, the average thickness is .02 millimetres.

§ Consult BRÜCKE—*Ueber ein in der Schleimhaut aufgefundenes Muskelsystem*, Sitzungsberichte der K. Acad. der Wiss. in Wien, Bd. VI, (1851) S. 214; also A. KÖLLIKER—*Ueber das Vorkommen von glatten Muskelfasern in Schleimhäuten*, Zeitschrift für Wiss. Zoologie, Heft I, 1851, and *Histologische Studien angestellt an der Leiche einer Selbstmörderin*, Würzburger Verhandlungen, Bd. IV, 1854, S. 55. From the statement of E. VERSON in Stricker's Handbuch, (Bd. I, S. 407,) it appears that MIDDELDORPF—*De Glandulis Brunneriannis*, Diss. Vratisl., 1846—observed this muscle before Brücke. I have not obtained access to Middeldorpf's dissertation.

‖ LOUIS FASCE—*Obs. microscopiques sur la couche musculeuse sous-muqueuse de l'intestin des mammifères*, Jour. de l'Anat. et de la Physiologie, T. I, 1864, p. 623—has described these fibres, proceeding from the muscle of Brücke towards the surface of the mucous membrane, as a third layer.

submucosa. In this region, moreover, a considerable number of lymphoid elements, resembling those of the adenoid tissue of the mucous membrane, lie in the meshes of the reticulum. A small number of similar elements are found scattered in all parts of the submucous connective tissue; many of them are of irregular form, and are probably wandering white corpuscles. By the action of silver solutions it is shown that the fibrillated matrix of the submucous connective tissue is channelled by an intricate series of anastomosing lacunæ, the serous canals (saft canälchen) or lymph-spaces, which inosculate with the lymphatics.* The stellate cells of the connective tissue appear to lie on the margins of these canals, and the investigations of Ranvier and Boll into the structure of tendon† would seem to render it probable that the well-known figures which they present in sections result from their deformation by the methods of preparation usually employed, and that in fact these elements are irregular flattened plates which form a partial covering to the separate bundles of connective tissue fibrillæ, or an imperfect endothelium to the serous canals. The bloodvessels of the submucous connective tissue form a rich plexus just beneath the muscle of Brücke, from which the vessels of the mucosa are derived.

Another point to which it seems desirable to refer in this place is the structure of the closed follicles of the intestine and their relation to the lymphatics. Both in the case of the solitary follicles (solitary glands) and of the individual follicles which make up the patches of Peyer,‡ the glandular parenchyma is essentially similar in structure to the adenoid tissue of the mucous membrane, being composed of a reticulum of delicate stellate cells the meshes of which are filled with lymphoid elements. These follicles lie chiefly in the submucous connective tissue beneath the muscle of Brücke, but their apices penetrate through openings in this muscle into the mucous membrane proper, and extend between the glands of Lieberkühn almost or quite to the epithelial layer. That portion of their parenchyma which thus lies in the mucous membrane is not bounded by any distinct sheath, but is directly continuous with the adenoid tissue of the mucous membrane, while the portion which lies in the submucous connective tissue is invested by a sheath of some-

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* F. v. RECKLINGHAUSEN—*Die Lymphgefässe und ihre Beziehung zum Bindegewebe*, Berlin, 1862.

† RANVIER—*Des éléments cellulaires des tendons et du tissu conjonctif lache*, Archives de Physiologie, 1869, II, p. 471; FRANZ BOLL—*Untersuchungen über den Bau und die Entwickelung der Gewebe*, Archiv für Mikroskopische Anatomie, Bd. VII, (1871,) S. 275.

‡ PEYER [*op. cit. supra*] not only described the patches which bear his name, and which he spoke of as "corpusculorum glandulosorum agmina sive plexus," or simply "plexus glandulosi," and the isolated glands of the same character in the small intestine, but also the similar glands in the large intestine, which he himself called "glandulæ solitariæ." TODD and BOWMAN [*op. cit.*, Vol. II, p. 33] have claimed, with apparent justice, that prior to the publication of Peyer's work in 1677, these glands had been "discovered in several animals" by Dr. NEHEMIAH GREW, "who also delineated them with great accuracy, and described them in his lectures to the Royal Society, in the year 1676." There is in the library of the Surgeon General's office a copy of GREW'S *Catalogue of the Rarities belonging to the Royal Society and preserved at Gresham Colledge*, London, 1681, to which is subjoined "*The Comparative Anatomy of Stomachs and Guts begun. Being several Lectures read before the Royal Society. In the year*, 1676. London, Printed by W. Rawlins, for the Author, 1681." On the reverse of the title-page of this subjoined work is the following "*Advertisement to the Reader*, Whereas a Book Entitul'd, Exercitatio Anatomico-Medica de Glandulis Intestinorum, earumq; Usu et Affectibus. Cui subjungitur Anatome Ventriculi Gallinacei. Studio Joh. Conradi Peyeri Scaffusa-Helvetii, 1677. In which are found some of those Observations contained in the following Lectures. It was therefore thought fit, here to take Notice, That the said Book was not Published, till the Year after these Lectures were Read." The matter of these lectures has been rearranged into ten chapters, and evidently considerably modified to fit it for publication. As it was first printed five years after the appearance of Peyer's book, and as the advertisement shows that its author was acquainted with that work, it is impossible now to say how much modification was due to that circumstance. Nor can I ascertain the precise date of the execution of the plates, which might throw some light on the question. It appears from the dedicatory letter to the Catalogue that the plates were prepared for that work, which was not published till 1681. Be this as it may, I note that the second gut of the polecat is said to be "Glandulous and very thick." "The Glands extream small, no bigger than little *Pins heads*. Yet every Gland hath its *Orifice*, out of which a *Mucus* or *Pituita* may be visibly squeez'd." The third gut has two clusters of glands in it. "Each Gland in both these *Clusters*, is about the bigness of a *Mustard-Seed*. Each of these *Clusters*, may be called a little *PANCREAS INTESTINALE*. Their difference is, That This hath not one common *Ductus*," (p. 3.) Now absolutely nothing of all this appears in the plate representing "The Stom: and Guts of a Pole-Cat. Tab: 23." On the other hand, on the same plate the figure representing "The Stom: and Guts of a Fox" shows some fourteen groups of glands in the small intestine, and a number of solitary glands in the large intestine, together with a considerable number of similar glands in the pyloric half of the stomach, of all which only the "Clusters" in the small intestine are described in the text. These "Clusters" appear also in the plates in the figures of intestines of the mole, rat and rabbit, and in the text are also mentioned in the cat, bitch, etc., the description in the case of the last being rather the most satisfactory. When I compare these fragmentary observations with the beautiful and complete description given by PEYER of the glands of the human intestine, I do not feel that his credit ought to be diminished in the least by this subsequent publication. At the same time, I do not feel inclined to doubt, from the circumstances under which GREW'S publication was made, that he had actually noticed these glands in some of the lower animals before the appearance of PEYER'S work, or even that he may have called attention to them in his lectures before the Royal Society.

what condensed connective tissue, from which, however, it is to a great extent separated by large lymph-sinuses of irregular form, which appear in sections as one or more fissures between the parenchyma of each gland and its connective tissue-sheath. By the action of silver solutions these lymph-sinuses are shown to be lined with a single layer of flat endothelial cells. They communicate freely with the plexus of lymphatic capillaries in the mucous membrane and in the submucosa. This description substantially applies to the solitary follicles of both small and large intestine, as well as to the several follicles which make up the patches of Peyer; in the latter case the lymph-sinuses belonging to the individual follicles inosculate freely. The parenchyma of the closed follicles of the intestine is so similar in its structure to that of the lymphatic glands, and their relations to the intestinal lymphatics are so intimate, that of late they have very generally been regarded as minute lymphatic glands.

The lymphatics of the intestinal canal have been made the subject of much careful investigation, especially by Teichmann,* His,† Frey,‡ and Auerbach.§ In the mucous membrane of both small and large intestine there is a beautiful superficial network of lymphatic capillaries, the meshes of which surround the orifices of the glands of Lieberkühn. In the small intestine this network inosculates with the central lymphatic vessels of the villi; and in both small and large, it communicates freely with a second plexus in the submucosa; a third plexus exists between the circular and longitudinal layers of the muscular coat, and a fourth in the subperitoneal connective tissue. These several networks communicate freely with each other, and from them the lymphatic trunks of the mesentery and mesocolon take their rise.

The nerves of the intestine form two distinct networks, of which one, the plexus of Meissner,‖ lies in the submucosa, and gives off branches to the bloodvessels, muscle of Brücke, and mucous membrane; the other, the plexus of Auerbach,¶ lies between the circular and longitudinal layers of the muscular coat, and is distributed chiefly to their fibre-cells. Both these networks are composed of non-medullated nerve-fibres, and are provided with numerous ganglia composed of from two or three to thirty, forty or more nerve-cells. The precise facts with regard to the ultimate relations of the terminal nerves in the mucous membrane are not yet known, nor have fruitful investigations been made as yet into the pathological alterations of these nerves.

Lastly, a few words may be said with regard to the epithelium, which covers all parts of the mucous membrane, including the villi, and lines the glands of Lieberkühn. This consists of the well-known single layer of columnar cells, among which, at irregular intervals, are scattered the so-called goblet-cells, (Becherzellen.)** These are somewhat conical or goblet-formed elements, attached by their apices to the mucous membrane, while their open mouths present towards the lumen of the intestine. They appear to be about half filled from the point upwards by a granular protoplasm, with or without a nucleus, while the wider portion of each cell seems to be empty. They have been by some sup-

* L. Teichmann—*Das Saugadersystem*, Leipzig, 1861.

† *Op. cit.*

‡ H. Frey—*Ueber die Lymphgefässe der Colon-schleimhaut*, Zeitschr. für wiss. Zool., Bd. XI. S. 374.

§ L. Auerbach—*Untersuchungen über Lymph-und Blutgefässe*, Virchow's Archiv, Bd. XXXIII, (1865,) S. 340.

‖ G. Meissner—*Ueber die Nerven der Darmwand*, Zeitschrift für rationelle Medicin, Bd. VIII, (1857,) S. 364. I have not obtained access to the original, and quote from Schmidt's Jahrbücher, Bd. XCV, (1857,) S. 154.

¶ L. Auerbach—*Ueber einen Plexus myentericus*, Breslau, 1862. I have not seen this paper, and cite from Stricker's *Handb.*, (see p. 317, note.)

** In the essay of Theodor Eimer—*Zur Geschichte der Becherzellen insbesondere derjenigen der Schleimhaut des Darmcanals*, Berlin, 1868—will be found an interesting account of these cells, with numerous references to the more important investigations made up to that date.

posed to be special organs for the absorption of fat and albuminoid bodies, others imagine them to secrete the intestinal mucus, and various other functions have been suggested, none of which can be regarded as demonstrated. On the other hand, it has been held that the goblet-cells are merely ordinary columnar cells transformed by the reagents employed, or by other post mortem influences, and this view is supported by the observations of Stricker and Kocslakoff,* who encountered, in experimentally produced acute inflammation of the mucous membrane of the stomach and intestines of the rabbit, tracts of considerable extent in which the columnar epithelium was entirely replaced by goblet-cells.

Debove† has recently described a layer of flat cells resembling endothelial cells in form, seen when the epithelium is pencilled off from the mucous membrane and the surface treated with a solution of silver, and supposed by him to constitute a limiting membrane between the epithelium and the proper tissue of the mucous membrane. It may, however, perhaps be questioned whether the forms displayed under these circumstances are not in fact simply the endothelial cells of the superficial blood and lymph capillaries which are brought into view by the same method.

Among the cells of the epithelium of recently killed mammals, (rabbit, guinea-pig, dog, cat,) Arnstein‡ has observed wandering white blood-corpuscles, which appear to find their way by this route from the bloodvessels of the mucous membrane into the lumen of the intestines, where they constitute the mucous corpuscles of the intestinal juices. Similar observations have been made by Eimer and Watney.§

The foregoing sketch has been confined chiefly to points with regard to which our knowledge has assumed its present shape during the last ten or fifteen years, to the exclusion of what may be found in the older text-books with which all medical readers may be assumed to be acquainted. It has been introduced chiefly for the benefit of those who have not been able to follow the progress of recent histological research, but with the hope that even those familiar with this branch of knowledge will find it of some service as indicating the anatomical stand-point whence the subsequent descriptions of the pathological histology of the intestines in diarrhœa, dysentery and fever are to be viewed.

*Histological methods employed.*—In studying the histology of the diseased intestine, the examination of portions taken as fresh as possible and immersed in serum or some nearly indifferent fluid, (as for example a .75 per cent. solution of chloride of sodium,) should not be neglected. Groups of a few villi, snipped off with curved scissors, portions of the mucous membrane or of the submucous connective tissue removed in the same manner, and fragments obtained by teasing with needles, may thus be examined with advantage, and permit the observation of details visible in no other way. The secretions adhering to the mucous membrane may also be advantageously examined either without reagents or diluted with some indifferent fluid. But for a complete study of the histology of the diseased intestines thin sections are indispensable. These may be obtained by fastening the pieces selected for study to a flat piece of cork with pins and permitting them to dry; thin

* STRICKER UND KOCSLAKOFF—*Experimente über Entzündung des Magens*, Sitzungsberichte der K. Acad. der Wiss. in Wien, Bd. LIII, Abth. 2, (1866,) S. 538.

† DEBOVE—*Sur la couche endothéliale sous-épithéliale des membranes muqueuses*, Comptes Rendus, December, 1872, p. 1775. Also, Brown-Séquard's Archives de Physiologie, January, 1874, p. 19, and Pl. II. WATNEY—*op. cit.*, p. 317, *supra*—advances similar views.

‡ C. ARNSTEIN—*Ueber Becherzellen und ihre Beziehung zur Fettresorption und Secretion*, Virchow's Archiv, Bd. XXXIX. (1867,) S. 527

§ T. EIMER—*Zur Becherfrage*, Virchow's Archiv, Bd. XL, 1867, S. 283—injected aniline-blue into the lymph sac of the frog, and found cells loaded with the color both in the mucosa and in the goblet-cells of the epithelium. WATNEY—*op. cit.*, p. 317, *supra*—made observations similar to those of ARNSTEIN, but insists that the lymph-corpuscles are always between the epithelial cells, and do not enter their substance as ARNSTEIN thought they do. He cites observations which he regards as corroborative by EBERTH, RINDFLEISCH, FRIES, LIPSKY and VERSON. He also asserts that the reticulum of the mucosa extends between the epithelial cells, and regards it as the chief route of fat-absorption.

perpendicular sections can then be cut with a sharp knife, and after soaking out in water, or glycerine and water, may be stained with carmine or aniline and immersed in glycerine, or in acidulated water, for microscopical examination. This somewhat rude method is of course open to several objections. The pieces are apt to shrink irregularly in drying, and never fully regain their normal characteristics even when carefully soaked out: moreover, the dried tissue is apt to split or chip off before the knife, so that it is not easy to obtain large sections; nevertheless, many of the particulars of the morbid changes may be made out by the study of sections of diseased intestine prepared in this simple way. Far better results can be obtained by freezing the portion to be examined and cutting thin sections of the frozen tissue.* These may be examined without previous treatment, in serum or some indifferent fluid, or they may be stained with carmine or aniline, silver, gold, or osmic acid, and mounted in glycerine. It is to be regretted that this excellent method was not known at the Museum till some years after the war; it certainly gives satisfactory results with normal tissues, and appears full of promise for future pathological investigations.

During 1864–'65 and '66 especially, the following method was employed at the Museum in preparing thin sections of diseased intestines:† The pieces selected were first boiled in a porcelain capsule with dilute nitric acid, (two or three drops of commercial acid to the ounce of distilled water,) the boiling being continued from two to five minutes, according to the thickness of the pieces. These were then pinned out loosely on a flat cork and allowed to dry; afterwards they were macerated in ether for some time. The latter step, originally intended to remove the greasiness of the tissue, which otherwise appeared under the microscope in the form of numerous oil drops, was found, if somewhat prolonged, to confer a peculiar non-elastic consistency upon the preparations which facilitated the cutting of thin sections of considerable size. The maceration in ether was therefore usually continued some time longer than would have been necessary to remove the grease, for which a day or two was sufficient. The thin sections were then cut by a razor, with the help of one of the section cutters usually employed in cutting microscopical sections of wood, and the nuclei having been tinted with red, blue or yellow aniline, the cuts were immersed in glycerine for study.

It was thus found possible to prepare perpendicular sections through the whole thickness of the intestine from one-half to three-quarters of an inch in length, and sufficiently thin to be studied with a $\frac{1}{5}$ or $\frac{1}{10}$-inch objective, or even higher powers. The boiled preparations did not shrink in drying like fresh pieces, and boiling in acidulated water, by rendering the connective tissue matrix transparent, brought the cellular elements more distinctly into view. These sections appeared to be so satisfactory that various methods were tried to secure their permanent preservation in the Museum. Immersion in Canada balsam did not answer well, the proper steps not having been hit upon at that time; the resulting preparations showed the general form of certain lesions such as ulcers, enlargement of the closed glands, &c.; but the elements of the tissues were not satisfactorily displayed. On the other hand, a considerable number of preparations were mounted in dilute acetic acid and other aqueous solutions, in pure glycerine, in glycerine acidulated with acetic acid, in Deane's preservative mixture of glycerine and gelatine, and in Farrants' gum and

* This result may be attained by a great variety of devices, for one of the most satisfactory of which consult WILLIAM RUTHERFORD—*A new Freezing Microtome*, The Monthly Microscopical Journal, Vol. X, (1873,) p. 185.

† For the original account of this method see J. J. WOODWARD—*On the use of Aniline in Histological researches; with a method of investigating the histology of the human intestine, &c.*, The American Journal of the Medical Sciences, Jan., 1865, p. 106. Boiling in glycerine, with or without the addition of two or three drops of nitric acid to the ounce, was subsequently used. The results were not materially improved by this change.

glycerine medium.* All these methods answered well for a while, the preparations mounted in acid glycerine being perhaps the most beautiful; but after a few months they began to deteriorate, and ultimately the majority of them perished. Those preserved in aqueous media were earliest lost; some by molecular changes in the sections, others by the evaporation of the preservative liquid through cracks in the varnish. Those preserved in acid glycerine kept longer, but ultimately became so granular, from slow molecular changes, that their structure was no longer recognizable, although the best English glycerine (Price's) had been employed. Moreover, most of those stained with aniline, which had been preferred to carmine on account of its more rapid and uniform action, speedily began to fade, so that after a few years only those stained with yellow aniline and mounted in Deane's and Farrants' media, especially the latter, remained in a serviceable condition. These had a longer life; less beautiful originally than those mounted in glycerine, they have altered very slowly, and a number of them were still in a serviceable condition, permitting the recognition of many details at the date of printing this paragraph.†

The most satisfactory perpendicular sections of both normal and diseased intestine as yet obtained at the Museum, however, were made by gradually robbing the tissue of its water and hardening it by immersion, first in strong, afterwards in absolute alcohol; imbedding the hardened piece in parafine to hold it in position while thin sections are cut with a razor; subsequently staining the sections with carmine, and transferring them through absolute alcohol and benzole to a solution of dried Canada balsam in benzole, in which they are permanently preserved.‡ This method, which has been quite extensively used at the Museum in the preparation of sections of various diseased tissues, gives such excellent results that it is a matter of regret it was not adopted at an earlier period, and especially that it was not employed during the war in the examination of fresh specimens of diseased intestines. After this method had been perfected, it was therefore a source of great satisfaction to find that it was applicable to the alcoholic preparations which had been collected at the Museum during the war, and that the results obtained from the use of this rich material were often fully equal to the best that could have been attained with perfectly fresh specimens. During the year 1877 a considerable number of such sections were prepared, and the results attained have been freely used in supplementing former work.

It was often found, especially when the specimen had originally been quite fresh when first introduced into alcohol, that it was already very firm, and that it was sufficient to transfer it for a while to absolute alcohol to fit it for the preparation of excellent sections, which were then stained and mounted precisely as when fresh material is treated with alcohol and sections prepared as soon as it is hard. In other words, little or no change had occurred in the ten or fifteen years during which the specimen had been immersed in alcohol. This favorable result was most frequently obtained in specimens of the colon; sometimes also of the small intestine. Very often, however, in the case of the latter, and sometimes

* The formula employed was that given by BEALE—*How to work with the Microscope*, 3d edition, London, 1865, p. 62—four ounces each of gum Arabic and distilled water, glycerine two ounces, all by weight, which differs from Mr. Farrants' original formula—Quarterly Journal of Microscopical Science, Vol. VI. (1858.) p. 118—especially in the absence of arsenious acid.

† *July*, 1877, eleven to fourteen years after they were put up.

‡ For a detailed account of this method, which is very generally available for the permanent preservation of thin sections of morbid tissue, see J. J. WOODWARD—*Microscopical Memoranda for the use of practitioners of Medicine*, The Lens, Vol. I. (1872.) pp. 31, 93, 158 and 223. Since these papers were published, various slight modifications of the processes detailed have been employed at the Museum. Of these I may specially mention the substitution of a solution of dried Canada balsam in absolute alcohol for the solution in benzole, mentioned in the text. The dried balsam is not wholly soluble in absolute alcohol cold, but if it be cut into small pieces with a hot knife, thrown into absolute alcohol in a beaker and heated over a water-bath, the whole of the balsam will dissolve, and when it cools no precipitation occurs. This solution has been used at the Museum a good deal, in the same way as the solution in benzole; but after several years' trial I am not satisfied that it offers any material advantages.

of the former, on opening the preparation jars the intestine was found to be quite soft and flaccid; and then immersion in absolute alcohol often failed to make it hard enough for section cutting. This was especially apt to be the case in specimens from autopsies made so long after death that putrefactive changes were fairly under way; and the reason the small intestine was more frequently affected than the large is, because it undergoes post mortem changes more rapidly. Such soft preparations were soaked for twenty-four hours in a concentrated solution of gum Arabic, and then thrown into alcohol till the gum was hardened. Sections were then cut in the usual way, and the gum afterwards soaked out with a little water before staining. Such sections stained with difficulty, as is always the case with pieces of intestine which come into the hands of the histologist so long after death that putrefactive changes have commenced. I must think, also, that the length of time that these preparations had been in alcohol had something to do with their slowness of staining; for preparations which had been quite fresh when originally put up also stained more sluggishly than recent preparations of the kind generally do. In many instances the lilac staining fluid, habitually employed at the Museum, proved quite inefficient, while excellent results were obtained by the original carmine fluid of Thiersch;* but in some few cases all attempts at carmine staining failed. I believe these were specimens in which putrefactive changes had well advanced before they were immersed in alcohol. Such specimens, as is well known, also refuse to stain even when quite recent.

Besides the foregoing methods, fresh specimens may be hardened by the action of various other reagents as a preliminary to the preparation of thin sections; as, for example, by dilute solutions of chromic acid, solution of bichromate of potassa, Müller's fluid, &c., followed by subsequent treatment with alcohol. These methods, however, did not yield as good results at the Museum as those given above. Recently Kelsch has made use of picric acid in hardening dysenteric intestines previous to the preparation of thin sections, and, if his drawings are to be regarded as simple copies from nature rather than as diagrams representing his interpretation of the appearances observed, with such admirable results as to make his method well worthy of thorough trial.†

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* The lilac staining fluid employed at the Museum was suggested by an observation made while using the "Lilafarbige Carmiutinctur" recommended by THIERSCH—*Der Epithelialkrebs*, Leipzig, 1865, S. 92—for staining cartilage and bones decalcified by chromic acid. He prepared that fluid as follows: 4 parts, by weight, of borax and 1 of carmine, are dissolved in 55 parts of distilled water. One volume of this solution is mixed with two volumes of absolute alcohol and then filtered. The resulting tincture is said by THIERSCH to stain somewhat more slowly than his carmine solution, which certainly does not exaggerate the facts. Now, when these directions are strictly followed, it will be found that by far the greater part of the carmine, crystalizing in some as yet unstudied combination with the borax, remains on the filter. It is precisely with these crystals, thrown away when the directions of THIERSCH are followed, that the most generally available carmine staining fluid yet employed at the Museum is prepared. The crystals are simply dissolved in distilled water to any desired degree of concentration, and the solution used in the same way as any other staining fluid. Sections stained in this way are at first tinted of a dark lilac color; but on subsequent treatment with a solution of oxalic acid in alcohol, as recommended by THIERSCH, or a mixture of hydrochloric acid and alcohol (one part of commercial hydrochloric acid to from three to six parts of alcohol of 70 to 80 per cent.) as preferred at the Museum, the nuclei assume a brilliant carmine red, while all superfluous color is removed from the intervening matrix. It might be thought that a mere solution of carmine in saturated borax solution would answer the same purpose, and so in truth it does when first mixed. On standing, however, like a simple ammoniacal solution of carmine, this mixture soon decomposes. Precipitation by absolute alcohol effects some changes in the composition of the carmine, which secures its preservation unaltered for a considerable time. The original solution of THIERSCH (*loc. cit.*) recommended in the text for staining sections of tissues preserved for years in alcohol, is prepared as follows: (A.) Take one part, by weight, of carmine, one of caustic ammonia, and 3 of distilled water; rub them up thoroughly together and filter the solution. (B.) Take one part, by weight, of oxalic acid and 22 of distilled water. Mix one volume of solution A with 8 of solution B; add 12 volumes of absolute alcohol and filter. The filtrate can at pleasure be made to incline to an orange-red by the addition of a little more of the oxalic acid solution; or by the addition of a little more ammonia, made of a violet color. Either will answer to stain with; but it was found at the Museum that *the orange-red fluid, when freshly prepared*, stained old preparations, such as are mentioned in the text, most actively. If, on the addition of the solution of oxalic acid crystals (of oxalate of ammonia) form, they may be separated by filtration, or dissolved by the addition of a little water.

† KELSCH—*Contributions a l'Anatomie path. de la Dysenterie Chronique*, Archives de Physiologie, July and Sept., 1873, pp. 406 and 573, and *Contribution à l'anatomie path. de la dysenterie aigue*, same Journal, Nov., 1873, p. 687. The method referred to is as follows: Remove from the diseased parts some quite small fragments, which are to be placed, without washing them, in strong alcohol for twenty-four hours, and then for one or two days in a saturated solution of picric acid; afterward they are to be stretched by means of pins on a slice of cork and soaked in a solution of gum for twenty-four hours; then, finally, in ordinary alcohol, in which the pieces will acquire sufficient firmness to permit very thin sections to be made with the microtome; these are to be colored with picro-carminate—p. 581. See also a memoir on the same subject by KELSCH—Mém. de la Soc. de Biologie, Tom. V, 1873, p. 3, (with a colored plate.)

*Histological changes in the inflamed intestines.*—The following is a summary of the chief textural changes to be observed in the inflamed intestinal mucous membrane when death takes place before the inflammatory process has proceeded to the stage of ulceration.* It will usually be found that the capillaries and small veins of the inflamed intestine are preternaturally full of blood, and this will be particularly noted in the circlet of capillaries by which the closed follicles are surrounded. This character is of course especially to be sought in those portions of the intestine which appear more or less red to the naked eye. It is best observed in clippings or frozen sections of the perfectly fresh intestine, but can also be recognized with more or less distinctness in sections prepared from portions of intestine hardened by any of the methods indicated above. As already mentioned,† the redness of the inflamed intestine may also be due to actual hæmorrhage into the tissue of the mucous membrane and submucous connective tissue, or to the transudation of the coloring matter of the blood. The former of these conditions usually occurs in the form of little hæmorrhagic extravasations, which are often exceedingly numerous, but also occasionally in larger patches. The latter is no doubt very frequently, at least, a post mortem appearance the result of commencing decomposition, though its occasional occurrence in well-defined purpura-like spots or blotches would seem to indicate that the transudation sometimes takes place during life.

At a very early period of the inflammatory process an increased number of lymphoid elements will be found scattered through the submucous connective tissue. This will be noticed especially in the immediate vicinity of the muscle of Brücke, where these elements are most numerous in the normal condition, but it will also be observed in all portions of the submucous tissue. It will frequently be observed in sections that the lymphoid elements occur in swarms around the peripheries of the small veins. They also appear in rows, and in more or less irregular stellate groups corresponding in outline to the serous canals of the connective tissue. These latter appearances were the foundation of the opinion formerly prevalent, that the new elements were produced by cell-multiplication from the connective tissue corpuscles; an opinion which the discovery of Cohnheim‡ compels us to modify, so far as to regard the new elements as consisting in part at least of white blood-corpuscles which have migrated from the bloodvessels. Whether any cell-multiplication actually occurs is difficult to be seen in the intestine.

The discovery of such an increase in the number of lymphoid elements in sections of the submucous connective tissue may be regarded as conclusive evidence that actual inflammation has existed during life, while the abnormal fulness of the bloodvessels alone, may result from mechanical obstructions to the portal circulation, or may represent merely a condition of hyperæmia hardly amounting to inflammation. Besides the lymphoid swarm

* An excellent description of the histological processes about to be considered is given by E. RINDFLEISCH—*Lehrbuch der Pathologischen Gewebelehre*, 3te Aufl., Leipzig, 1873, S. 296 *et seq.*; or the New Sydenham Society's translation of the second edition of the same work, Vol. I. London, 1872, p. 403 *et seq.* Histological details will also be found in most of the works cited in the first note on page 266 and the second note on page 292. I must confess to surprise at the summary manner in which the whole subject of the histology of intestinal catarrh is dismissed by LEUBE—*Krankheiten des Darms* in Ziemssen's Handbuch der Spec. Path. u. Ther., Bd. VII, Abth. 2, S. 246 *et seq*—also American transl., Vol. VII, New York, 1876, p. 358—according to whom desquamation of the epithelium, enlargement of the cells, a granular metamorphosis of their protoplasm, and indistinctness of their nuclei are the most important microscopico-anatomical alterations. He admits that the separation of the epithelium occurs also as a mere post mortem change, concerning which see subsequent remarks. The indistinctness of the nuclei is probably also merely a post mortem appearance, and the same may be true of some kinds of granular metamorphosis. There remains, therefore, but little in his description which can be regarded as characteristic of the morbid process. One paragraph, however, I must quote with approval, having myself expressed the same opinion on page 294; (see also note †, on the same page.) viz: "It should be borne in mind that an intestinal catarrh, with all its symptoms, may be present during life without any injection of the mucous membrane after death, just as happens in the case of other mucous membranes where inflammation can be directly seen during life, and which nevertheless appears pale at the autopsy."

† *Supra*, p. 297.

‡ J. COHNHEIM—*Ueber Entzündung und Eiterung.* Virchow's Archiv, Bd. XL, 1867, S. 1.

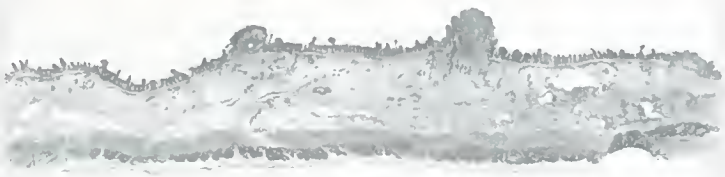
in the submucous connective tissue, this layer is generally infiltrated with an excess of plasma, by which the cohesion of the fibrillated matrix is loosened and the lymph-spaces increased in size. To this cause, together with the vascular congestion and the presence of the lymphoid swarm, is due the thickening of the submucous layer which is generally present. Sometimes also the large oval nucleated cells observed by Basch and Thierfelder* in sections of the colon from cases of diphtheritic dysentery are found lying loose in the lymph-spaces, or adherent to their parietes. They are probably swollen and loosened endothelial elements, and are especially noticeable in diphtheritic cases, or in chronic cases accompanied by follicular ulceration, in connection with which I shall again recur to them, and will then give a description of their appearance.

Simultaneously with the increase in the number of lymphoid elements in the submucous connective tissue, a similar increase takes place in the number of these elements in the adenoid tissue of the mucous membrane and of the closed follicles. Here the increased number is not to be recognized by simple inspection, as in the case of the submucous connective tissue, but must be inferred, because, while the closed follicles increase in dimensions, and while the adenoid tissue of the mucous membrane becomes more bulky, pushing the glands of Lieberkühn preternaturally apart,† the individual elements do not appear to be increased in size. The origin of these new elements also is a matter of inference rather than of observation; but, in the absence of direct evidence of the multiplication of the normal cells by division, the probability that the new elements chiefly accumulate by migration from the bloodvessels at once suggests itself as the most plausible view here as elsewhere. Of course, also, the possibility that the two processes may coexist should not be overlooked. In sections the margins of the swollen follicles are more or less obscured by a swarm of lymphoid elements in the adjoining submucosa. No reasonable explanation has been suggested for the fact already mentioned,‡ that the solitary follicles are more conspicuously enlarged than the agminated, the reverse of what usually occurs in typhoid fever.

The behavior of the columnar epithelium on the surface of the intestine while the foregoing changes are taking place remains involved in considerable obscurity. The intestinal epithelium separates from the mucous membrane, in consequence of cadaveric changes, at a very early period after death, even in the perfectly normal intestine. Perhaps this separation takes place at a still earlier period in inflamed intestines, as, indeed, all cadaveric changes appear to do. But the readiness with which even the normal intestinal epithelium separates after death, excites doubt as to the proper interpretation of those observations, which seem to indicate any very extensive desquamation of the intestinal epithelium during life as a result of the inflammatory process. Such observations, for example, as case 150,§ in which "desquamation of epithelium of ileo-colic valve, cæcum and ascending colon," is recorded in an autopsy made the day after death, in the month of September, can hardly be regarded as establishing even a probability that the epithelium separated during life. To warrant a belief that this has happened in any case, the exam-

* S. Basch—*Anat. u. klin. Untersuchungen über Dysenterie*, Virchow's Archiv, Bd. 45, [1869,] S. 204. & Taf, 13. A. Thierfelder—*Atlas der Path. Hist.*, Lief. 2, Leipzig, 1873, Taf. XII, Fig. 5. See also Heubner—in Ziemssen's Cycl., Am. edit., Vol. I, [New York, 1874,] p. 543.

† A similar increase of the adenoid tissue of the mucous membrane of the small intestine would appear to have been observed by Beale—*Microscopical Researches on the Cholera*, No. V, The Medical Times and Gazette, Vol II, for 1866, p. 388—in the intestines of subjects dead of Asiatic cholera. He describes it as combined with a "wasting and shrivelling" of the glands of Lieberkühn, "allied to that wasting which occurs in the gland structure of the liver in cases of cirrhosis, and of the kidney in chronic degeneration of this organ;" and his diagrams, Figs. 14 to 18, not merely represent the follicles as more or less pushed apart, but as diminishing in diameter in proportion as they are separated. This wasting of the glands of Lieberkühn was not observed at the Museum in any of the cases of intestinal inflammation examined. ‡ *Supra*, p. 298. § *Supra*, p. 114.



ination should be made much sooner after death than is usually practiced. Certainly the autopsies which furnished the material examined at the Museum, in connection with diarrhœa and dysentery, were generally made long enough after death to render it certain that the separation of the epithelium observed was merely a post mortem phenomenon.*

Rindfleisch† still maintains that an endogenous formation of pus corpuscles may take place in the epithelial cells of inflamed mucous membranes, though he does not look upon this as the exclusive mode of their formation. The observations on which this view is based, with the single exception of that brought forward by Eberth,‡ were not made on the intestinal mucous membrane; still, if it were certain that pus corpuscles originated in this manner on other mucous membranes, the occurrence of the same process in inflamma-

* It may be here remarked that the very general belief that an extensive desquamation of epithelium takes place in the intestinal catarrh of Asiatic cholera is probably also the result of a misinterpretation of post mortem changes. This view was put forth by LUDWIG BÖHM—*Die kranke Darmschleimhaut in der Asiatischen Cholera mikroskopisch untersucht*, Berlin, 1838, S. 7, u. 19; also Tab. 1—as the result of post mortem examinations of the intestinal mucous membrane and of the contents of the alimentary canal. It is supported among others by NIEMEYER—*Lehrbuch der spec. Pathologie und Therapie*, 7te Aufl., Bd. II, S. 725; and RINDFLEISCH, S. 204. *op. cit.*, p. 325, *supra*—and among the English observers, especially by BEALE—*Microscopical Researches on the Cholera*, Med. Times and Gazette, Vol. II, for 1866, p. 166. It may be remarked, however, that of the seven figures of detached epithelial cells given by the latter author in the paper cited, six are stated to have been taken from the jejunum; hence, of course, from the intestinal contents, and not from the rice-water stools; while the source of the cell represented in the seventh figure is not stated. The supposition that the appearances observed in the fluid contents of the alimentary canal after death may be predicated of the rice-water stools discharged during life, is an error often encountered in cholera literature. And yet a moment's reflection ought to show that if the epithelium were thrown off during life as actively as asserted, the intestines after death could hardly be expected to contain such immense quantities of detached epithelium as are actually found. It is astonishing to find so careful an observer as J. L. W. THUDICHUM—*Report on Cholera Chemically investigated*, Ninth report of the Medical Officer of the Privy Council, (1866.) London, 1867, Appendix No. 10, p. 458—heading a section of his paper "Chemical examination of intestinal contents and rice-water discharges," p. 482, which is devoted solely to an examination of the contents of the colon of a cholera patient, removed from the body after death. It is not, however, so astonishing to find practitioners unpracticed in histological investigations quoting his statement, based on this examination, that rice-water contains "cells from the surface of the intestine," as an authoritative description of the cholera stools. This has been done, especially by C. MACNAMARA—*A Treatise on Asiatic Cholera*, London, 1870, p. 351—and by my colleague, Surgeon E. MCCLELLAN, U. S. Army, in his report on *The Cholera Epidemic of* 1873 *in the United States*, Washington, Government Printing Office, 1875, p. 42. MACNAMARA goes further, and affirms that in the case of a little boy three years old suffering from cholera, he examined "the first stool" and found that "it contained a vast number of columnar epithelial cells." He has also described a "rapid molecular formation in the epithelial-cells of the intestinal canal," observed after death, by which the cells are ultimately completely destroyed, thus producing the "molecular masses which constitute the bulk of the flocculent substance noticed in the rice-water stools of cholera patients." MACNAMARA made his observations with a 1-70th of an inch objective by Messrs. Powell and Lealand, of which he naively says: "I confess I have learned but little through the aid afforded me by this marvellous piece of optical work," p. 336. MCCLELLAN, besides citing THUDICHUM and MACNAMARA, gives in detail (*op. cit.*, p. 37 *et seq.*) the results of a series of microscopical examinations made by Dr. I. N. DANFORTH, of Chicago, in 1873, of which I regret that I cannot speak with praise. DANFORTH received for microscopical examination "eleven bottles containing specimens of the dejections." He "observed occasional oblong patches of small round or polygonal cells, probably epithelial cells thrown off from the villi and floor of the intestinal canal; and, scattered here and there, an occasional full-grown epithelial cell, not yet carried out of the intestine, (*sic.*) but looking cloudy and nebulous, as though it had been for some time macerated in the intestinal contents." I should think this passage a misprint, but it is repeated textually in a *Note upon the results of microscopic examination of the choleraic discharges*, Public Health, Vol. I. (for 1873.) New York, 1875, p. 264. It will not surprise the reader that this gentleman found in the small intestine of a cholera patient that "the villi are nearly all torn away, and the remaining stumps present a rather ragged appearance." (*Sic.*) See MCCLELLAN, *op. cit.*, p. 41. On the other hand, almost all those who have made a special study of the rice-water discharges in cholera, have failed to find any noteworthy quantity of epithelial cells in them. Consult, among others, E. A. PARKES—*On the Intestinal discharges in Cholera*, London Journal of Medicine, Vol. I, (1849,) p. 151; W. LAUDER LINDSAY—*Histology of the Cholera evacuations in Man and the lower animals*, The Edinburgh Medical Journal, Feb. and March, 1856, pp. 728 and 810; MCCARTHY and DOVE—*Abstract of notes of the Cholera cases under the care of Dr. A. Clark, with remarks.* The London Hospital Clinical Lectures and Reports, Vol. III. 1866, Appendix, p. 451; MAX BRUBERGER—*Chemisch-mikroskopische Beobachtungen aus dem städtischen Cholera-Lazareth No. III in Berlin*, Virchow's Archiv, Bd. XXXVIII, (1867,) S. 301—who investigated this question in the stools of five hundred and forty cholera patients. HAYEM—*Bull. et Mém. de la Soc. Méd. des hôpitaux de Paris*, T. X, 1873, p. 265; also *L'Union Médicale*, T. XVI, 1873, p. 541, and T. R. LEWIS—*A report on the microscopical objects found in cholera evacuations, &c.*, Sixth Annual Report of the Sanitary Commissioner with the government of India, 1869, Calcutta, 1870, Appendix A, p. 151—who, after most ample opportunities for observation, writes: "It may perhaps be remarked that no drawing of columnar epithelium, said to be so universal in cholera dejecta, appears in this report. The reason is that its presence, to an appreciable extent, has not been observed in the contents of the intestine discharged during life." The weight of the evidence would certainly appear to warrant the conclusion of AITKEN—*Science and Practice of Medicine*, 3d Amer. from the 6th Lond. edit., Philadelphia, 1872, Vol. I, p. 654—that the separation of the epithelium alleged to take place in cholera is to be interpreted simply as a post mortem change.

† *Op. cit.*, S. 56, u. 303.

‡ C. J. EBERTH—*Zur Entstehung der Schleimkörper*, Virchow's Archiv, Bd. XXI, (1861.) S. 106—describes and figures what he interprets as the endogenous formation of mucous corpuscles in the columnar epithelial cells of the duodenum of a duck killed during digestion. Among the other observations which appear to support the same view, I may mention the following: BUHL—*Ueber die Bildung der Eiterkörperchen*, Virchow's Archiv, Bd. XVI, (1859,) S. 168—observed in a pneumonic lung certain forms, which he interpreted as epithelial cells, from the air vesicles, containing pus corpuscles of endogenous origin. REMAK—*Ueber endogene Entstehung von Eiter-und Schleimzellen*, Virchow's Archiv, Bd. XX, (1861,) S. 198—found similar forms in the urine, which he interpreted as examples of the endogenous formation of mucous or pus corpuscles in the epithelial cells of the bladder and ureter. It may be mentioned, however, that in the two cases referred to by this investigator one patient presented evidences of uræmic intoxication, and the other of albuminuria, so that the possibility is suggested that the figures in question may represent fragments of fibrinous casts with imbedded pus corpuscles from the kidneys. BUHL—*Ein Fall von ulcerativer Pylephlebitis. Bildung der Eiterkörper*, Virchow's Archiv, Bd. XXI. (1861,) S. 483—in a later paper describes and figures the endogenous formation of pus in the columnar cells of the biliary passages; and RINDFLEISCH—*Ueber die Entstehung des Eiters auf Schleimhäuten*, Virchow's Archiv, Bd. XXI, (1861,) S. 486—by the examination of the secretion in catarrhal inflammation of the air passages and of the inflamed bronchial mucous membrane, but especially by means of perpendicular sections of the nictitating membrane of the frog, in which he induced inflammation by means of glacial acetic acid, seemed to have placed the doctrine of the endogenous origin of pus corpuscles in epithelial cells on the basis of direct observation. It has since been called in question by VOLKMANN and STRUDENER—*Ueber die endogene Eiterzellenbildung.* Centralblatt für die med. Wiss. 1868, No. 17, S. 257, and again supported by L. OSER—*Ueber endogene Bildung von Eiterkörperchen an der Conjunctiva des Kaninchens*, Studien aus dem Institute für Exp. Pathologie in Wien, Wien, 1870, S. 71.

tion of the intestinal canal would certainly appear highly probable. On the other hand it must be remarked that the intestinal contents in cases of diarrhœa and dysentery, especially the mucus or muco-pus coating inflamed patches of mucous membrane, have been subjected many times to microscopical examination at the Museum; but that although columnar epithelial cells, both isolated and adhering together, were usually present in multitudes along with the more or less abundant pus corpuscles, no appearances were ever observed which seemed to support the view in question.

Yet another mode in which pus corpuscles may possibly arise from the epithelium of the inflamed intestines is indicated by the paper of Stricker and Kocslakoff, already referred to,* in which it is suggested that the goblet cells they observed to replace the columnar epithelium in the inflamed stomach of rabbits, were produced by a rupture of the latter cells and the escape of a portion of their protoplasm without or with the nucleus, and that in the latter case the nucleated masses of protoplasm thus set free would correspond in appearance to many of the elements found in the secretion with which the inflamed surface was coated. Further observations, however, are needed before this view can be regarded as more than a mere possibility. Finally, the observations of Arnstein, Eimer and Watney, already quoted,† suggest the probability that the pus corpuscles found in the secretions of the inflamed mucous membrane may in fact be migrated white blood corpuscles which have found their way into the lumen of the intestine through the epithelial layer.‡ In the present condition of pathological histology this view commends itself to the most favorable consideration, but more detailed observations are required before it can be accepted as fully established.

In addition to the alterations which have been sketched, certain changes are sometimes observed in simple acute inflammations of the intestine, which, however, are more frequently present among the turbulent disturbances of diphtheritic dysentery, or the extensive alterations of chronic follicular ulceration of the colon; I refer to a peculiar cyst-like transformation of the glands of Lieberkühn, in the course of which they sometimes invade the tissue of the closed follicles in the curious manner so well described and figured by Kelsch§ in his account of the lesions characteristic of chronic diarrhœa and dysentery. I have observed this process in several cases of simple intestinal catarrh of a few weeks' duration, but so much more frequently in chronic cases, or in diphtheritic dysentery, that its further discussion is postponed until these conditions come under consideration.

I have collected a number of photo-micrographs illustrative of the histology of the inflamed intestines, a few of which have been selected for reproduction. The plate facing page 326 is an etching on steel from a photo-micrograph of a portion of No. 417, Microscopical Section, Army Medical Museum, and the annexed diagrammatic figure (Fig. 3) is intended to aid in its interpretation.

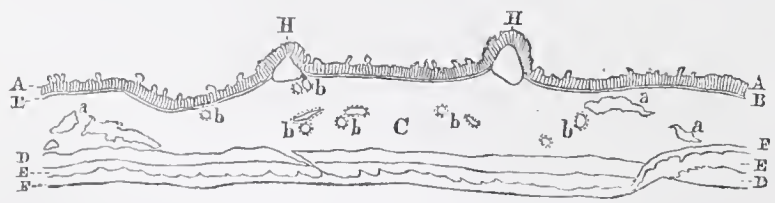
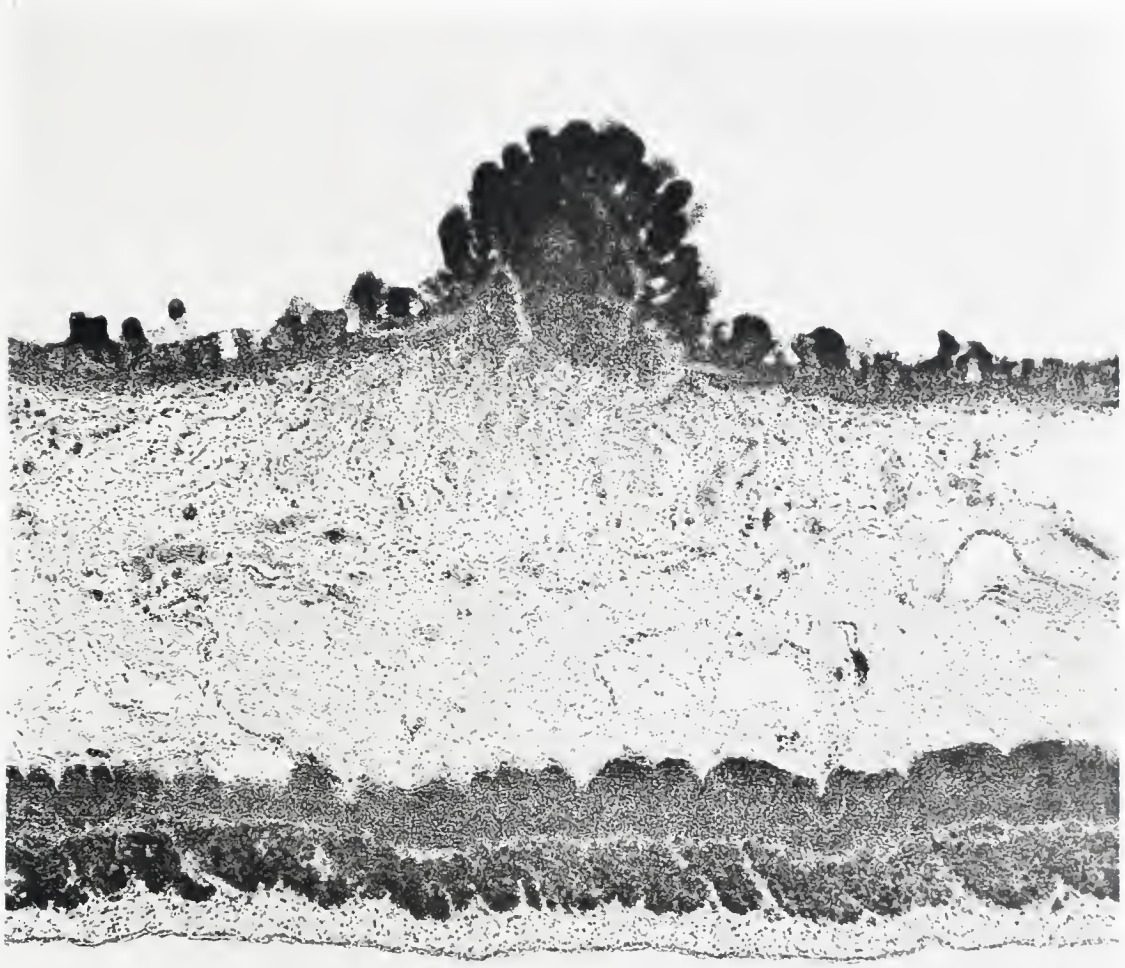



Fig. 3. Diagram explanatory of the plate facing page 326. A. Mucous membrane, with glands of Lieberkühn and villi. B. Muscle of Brücke. C. Submucous connective tissue, showing at *a*, *a*, *a*, accidental rents, and at *b*, *b*, *b*, *b*, bloodvessels cut across. D. Circular muscular coat. E. Longitudinal muscular coat. F. Subperitoneal connective tissue.

* *Supra*, p. 321. † *Supra*, p. 321.

‡ ARNSTEIN not merely stated that the white corpuscles migrating between the epithelial cells may enter their substance, as mentioned in the note on page 321, *supra*, but asserted that he has seen red blood corpuscles also imbedded in the substance of the epithelial cells, in the hæmorrhagic condition of the mucous membrane produced by injecting oil into a loop of intestine in a living rabbit. These statements, if correct, explain away the observations on which the doctrine of the endogenous formations of pus in epithelial cells is based § *Loc. cit.*, p. 324, *supra*.



*Heliotype.* *James R. Osgood & Co, Boston*

PERPENDICULAR SECTION OF ILEUM

SHOWING AN ENLARGED SOLITARY GLAND. MAGNIFIED 63 DIAMETERS.

PHOTO-MICROGRAPH BY ASSISTANT SURGEON J. J. WOODWARD, U. S. A.

From No. 417. MICROSCOPICAL SECTION.

The plate represents a perpendicular section of an inflamed ileum with two enlarged and protruding solitary glands, as seen with a power of twelve diameters. The preparation is one of a series of seven perpendicular sections cut transversely to the axis of the ileum through two enlarged glands, various planes of which are thus displayed. They are numbered in the Catalogue of the Microscopical Section 416 to 422 inclusive,* and are from the same subject as Nos. 459 and 460 of the Medical Section of the Museum. The patient, Private John Rice, company F, 10th Vermont, died, October 14, 1861, at the Annapolis Junction hospital, of diarrhœa following typhoid fever. On autopsy several well-marked cicatrices of former ulcers of Peyer's patches were found in the ileum, together with inflammation of the mucous membrane and enlargement of the solitary glands. The colon was thickened and ulcerated. This case will be given in full hereafter, together with a plate representing several of the cicatrices referred to.

The plate facing page 328 is a reproduction of a photo-micrograph of a portion of the same preparation as seen with a higher power. It is magnified 63 diameters, by a Beck's two-thirds of an inch objective. Fig. 4 is a diagram intended to aid in the interpretation of this plate.

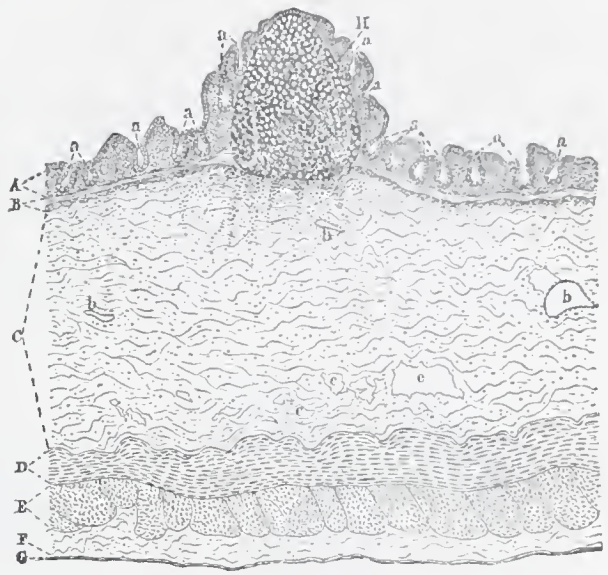



Fig. 4. Diagram explanatory of the plate facing page 328. A. Mucous membrane, showing the follicles of Lieberkühn *a, a, a, a*, pushed apart by the abnormal growth of adenoid tissue. B. Muscle of Brücke. C. Submucous connective tissue, showing sections of bloodvessels, as at *b, b, b*, and some accidental rents, as at *c, c, c*. D. Circular layer of the muscular coat of the intestine. E. Longitudinal layer. F. Subperitoneal connective tissue. G. Peritonæum. H. Enlarged solitary gland. The cells of the epithelium, adenoid tissue and solitary gland in this diagram are much exaggerated in size, and, of course, correspondingly few in number.

The portion of the specimen represented displays at the middle of its upper edge an enlarged solitary gland, about one-sixtieth of an inch in its large diameter, projecting from the surface and situated almost entirely above the level of the muscle of Brücke, so as to form a minute tumor which bears upon its periphery the villi and glands of Lieberkühn displaced by its growth. The intestine is somewhat thickened, the thickening chiefly affecting the submucous connective tissue. In the mucous membrane the glands of Lieberkühn are pushed considerably apart by the increased quantity of adenoid tissue. The villi have been damaged by the razor in making the section, and are not well shown. The thickened submucous connective tissue displays a swarm of lymphoid elements, which are most numerous in the vicinity of the enlarged solitary gland and just below the muscle of Brücke. These appear in the plate as round or irregular black dots, which are so numerous immediately below the solitary gland as to obscure its inferior outline. In preparing the specimen some accidental violence, probably undue pressure of the thin glass cover, has produced a certain amount of laceration of the connective tissue just above the circular muscle, giving rise to a number of gaps of various sizes. Indications of the course of the enlarged bloodvessels cut transversely, or at various degrees of obliquity, can also be observed in the submucosa and even in the solitary glands. For the most part these vessels are stuffed

* *Catalogue of the Microscopical Section of the U. S. Army Medical Museum*, Washington, 1867, p. 53. In the description there given it is stated that there is "active cell-multiplication" in the submucous connective tissue in these preparations; a statement based on the number of cellular elements present, and which, on the re-examination of the preparations in the light of our present knowledge, it seems necessary to modify.

with bloodclots, and hence appear black and opaque; a few of the larger vessels, however, are empty. The muscular coat of the intestine and the peritonæum present no marked abnormity; in the subperitoneal connective tissue, however, an unusual number of lymphoid elements are present. The series of preparations to which the one here represented belongs were prepared by the method described on page 322, stained with yellow aniline, and preserved in Farrant's gum and glycerine mixture; they are still, at the time of printing this paragraph,* in a serviceable condition, and can advantageously be studied with much higher powers ($\frac{1}{5}$ to $\frac{1}{10}$) than that used for preparing the photo-micrograph here reproduced. At one extremity of most of them the section passes through a portion of a slightly thickened Peyer's patch, the several somewhat enlarged follicles of which are surrounded by a swarm of lymphoid elements in the submucosa, similar to those shown in the plate beneath the solitary glands. In portions of most of the sections, also, a few of the villi have escaped destruction by the razor. They are all, of course, denuded of epithelium. There are in the Museum quite a number of microscopical preparations, which exhibit various stages of similar lesions of the ileum, some from subjects in which mere inflammation of the colon coexisted, while in others it was coated with pseudomembrane or more or less ulcerated.†

A representation of the conditions to be observed in the case of a slight degree of enlargement of the solitary glands of the colon will be found in the plate facing this page, which is a reproduction of a photo-micrograph of a portion of No. 650, Microscopical Section, magnified 63 diameters by a Beck's two-thirds of an inch objective. The specimen is one of a series of perpendicular sections, Nos. 642 to 650, Microscopical Section, which were cut transversely to the axis of the colon, and prepared for permanent keeping in the same way as the specimens of small intestine just described. This series is from the same colon as No. 547, Medical Section. The patient was Private J. Zinke, the history of whose case was presented on page 308, in connection with a chromo-plate representing the appearances of the colon when recent. It was there stated that this man died of aneurism of the aorta a short time after recovering from a diarrhœa of some months' duration. The colon was in a condition of resolution, but had not yet attained perfect restoration to the normal state, the solitary glands were still somewhat enlarged, and were the seat of pigment deposit.

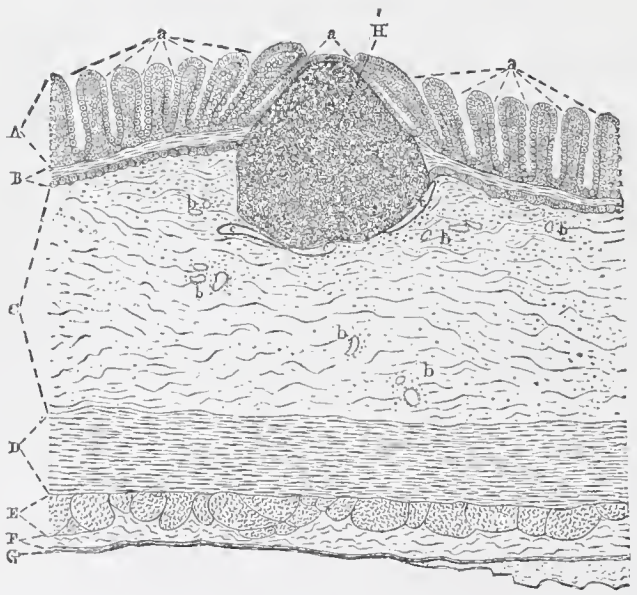
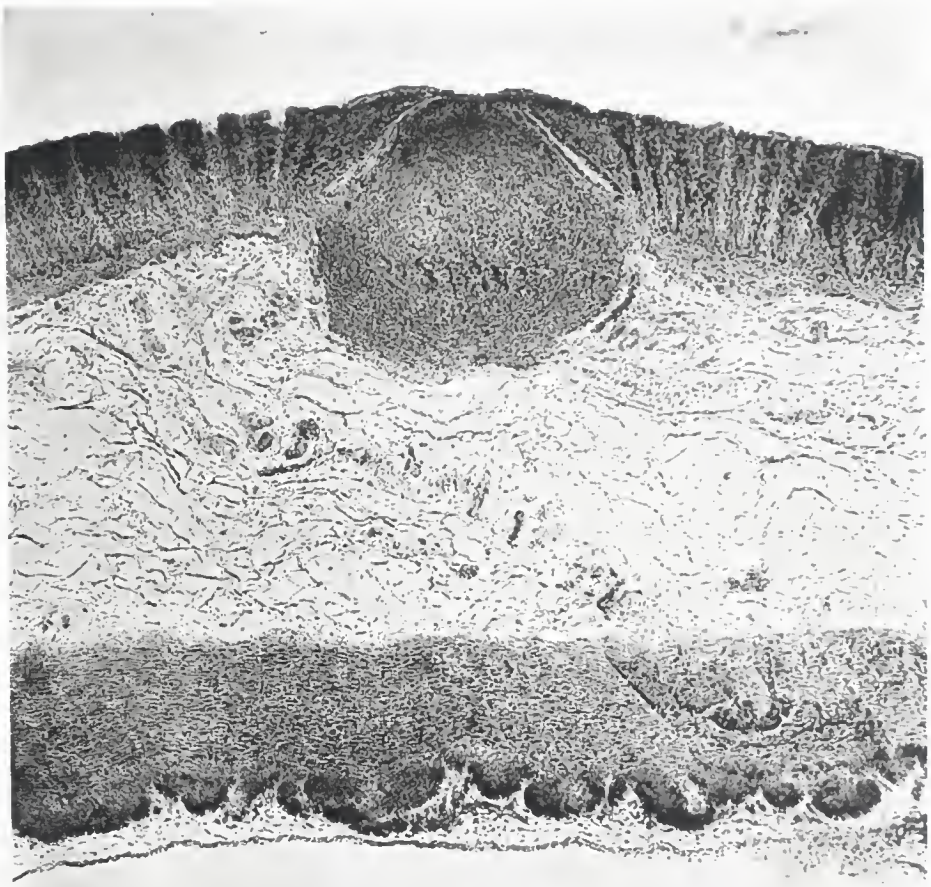



FIG. 5.—Diagram explanatory of the plate facing this page. A. Mucous membrane, showing the follicles of Lieberkühn, *a*, *a*, *a*, pushed apart by a somewhat increased quantity of adenoid tissue. B. The muscle of Brücke. C. The submucous connective tissue, showing sections of bloodvessels, as at *b*, *b*, *b*, and of the lymph sinus *c*, *c*, adjoining the enlarged solitary glands. D. Circular layer of the muscular coat of the intestine. E. Longitudinal layer. F. Subperitoneal connective tissue. G. Peritonæum. H. Enlarged solitary follicle. The cells of the epithelium, adenoid tissue, and solitary gland in this diagram are much exaggerated in size and of course correspondingly few in number.

* September, 1877.

† I am not acquainted with any satisfactory pictorial representation of the microscopical appearances under consideration. ALBERT THIERFELDER—*Atlas der pathologischen Histologie*, Lief. 2, Leipzig, 1873, Taf. XI, Fig. 3—gives a drawing of "follicular catarrh of the ileum," as seen with a low power, which, however, represents a section through a Peyer's patch, and gives of course no notion of the peculiar protrusion of the enlarged solitary glands in such cases.



*Heliotype.* *James R. Osgood & Co., Boston.*

PERPENDICULAR SECTION OF COLON.

SHOWING AN ENLARGED SOLITARY GLAND. MAGNIFIED 63 DIAMETERS.

PHOTOMICROGRAPH BY ASST. SURGEON J. J. WOODWARD, U.S.A.

From No. 1050. MICROSCOPICAL SECTION.

The portion of the section represented in the plate, an explanatory diagram of which is presented in Fig. 5, exhibits at the middle of its upper surface a somewhat enlarged solitary follicle, about $\frac{1}{10}$ of an inch in diameter, which, it will be observed, does not project above the general surface of the mucous membrane in the way enlarged follicles so often do in the small intestine, but nevertheless appears to have produced some protrusion of the mucous membrane around it, so that the surface slopes upwards on each side from the edges of the picture to the apex of the follicle. The total thickness of the portion of intestine represented is about $\frac{1}{16}$ of an inch, of which nearly one-half belongs to the thickened submucous connective tissue, where the number of scattered lymphoid elements is somewhat more numerous than normal, especially in the vicinity of the enlarged solitary gland. Just below this gland there are two fissures which represent sections of the lymph sinus which surrounds its base. The adenoid tissue of the mucous membrane is somewhat increased in quantity. On microscopical examination of the section from which the photograph here reproduced was taken, the pigment ring which has been described as surrounding the solitary follicles and the diffuse streaks of pigmentation on the general surface of the mucous membrane were found to consist of brown granules deposited for the most part in the lymphoid cells of the adenoid tissue between the glands of Lieberkühn, while the dots of pigment in the solitary follicles consisted of similar granules deposited in the lymphoid cells of the parenchyma of these glands. In the first two situations, the pigment was most abundant about midway between the epithelium and the muscle of Brücke. This was not shown in the photograph, because the brown pigment and the yellow aniline were very nearly equally non-actinic; it can still, however, be pretty well made out in the microscopical preparation.

Besides the above series, there are a number of other preparations in the Microscopical Section of the Museum which exhibit enlargement of the solitary glands in the inflamed colon, and the same lesion is displayed in portions of a number of the preparations in the same collection which illustrate ulceration of the colon. These preparations differ in the degree of enlargement of the solitary glands, in the abundance of the lymphoid elements in the submucous connective tissue, in the extent to which the glands of Lieberkühn are pushed apart by the accumulation of new elements in the adenoid tissue of the mucous membrane, and in the degree to which the coats of the colon, especially the submucous connective tissue, are thickened. They differ from each other, however, rather in degree than in any essential feature; and the plate just described will serve to give a good general notion of them all.

The description given above of the pigment deposit in the series No. 642 to 650, Microscopical Section, may be taken as generally true for the pigment deposits found in chronic cases in both the small and large intestine, in so far that the pigment granules are most abundantly found in the lymphoid elements of the closed glands and of the adenoid tissue of the mucous membrane. In the small intestine the extremities of the villi are a common seat of the pigmentation, as has already been mentioned.* In this case also the pigment granules are most abundant in the lymphoid elements of the villi.† Sometimes, however, both here, and in the other situations mentioned, the pigment appears in masses of larger size, and apparently between the lymphoid elements instead of in their substance.

* *Supra*, p. 305. † See, for a figure representing this condition, the Atlas of *Thierfelder*, (*op. cit.*) Lief 2, Taf. XI Fig. 5.

The next two plates are intended to illustrate certain points in the arrangement of the swarm of lymphoid elements in the mucosa and submucous connective tissue as seen in sections of the intestine in both acute and chronic cases. The plates are reproductions of four photo-micrographs taken from different portions of the same preparation, No. 668, Microscopical Section, which is a perpendicular cut of the colon made parallel to the axis of the intestine, from a boiled piece stained with yellow aniline. The intestine selected was affected with subacute inflammation of two or three months' duration, and was not only thickened, but ulceration had already commenced in the vicinity of some of the solitary follicles; these were surrounded by circles of ulceration in the centres of which the swollen follicles still maintained their integrity. The submucous connective tissue was moderately swollen, ($\frac{1}{30}$ to $\frac{1}{20}$ of an inch in thickness.) The specimen was cut through the margin of a patch of more intense inflammation, whence the lymphoid elements are more numerous at one of its extremities than at the other, and this rendered it possible to select views showing different stages of the process.

The plate facing this page is a reproduction of two photo-micrographs taken from the left half of the cut, where the submucosa is least thickened and has fewest new elements. They are magnified 280 diameters by a one-fifth immersion objective made by R. B. Tolles, of Boston. Each represents adjoining portions of the mucous membrane and of the submucous connective tissue. In the mucous membrane of both the glands of Lieberkühn are pushed apart in consequence of the accumulation of lymphoid cells in its adenoid tissue. In the submucous connective tissue of both a few lymphoid cells are scattered among the proper elements of the tissue; but the most conspicuous appearance in each view is presented by a small vein just below the muscle of Brücke, which is surrounded concentrically by a dense lymphoid swarm, while a small artery in the immediate vicinity (on the left of the vein in the upper view, on the right of the vein in the lower view) has comparatively few lymphoid elements around it. All the processes are more advanced in the lower view, and especially the lymphoid swarm around the vein occupies in it a greater area, and is composed of a much larger number of lymphoid cells. The light line that crosses the lower view obliquely from above downward is the optical expression of a crack in the thin cover of the preparation.

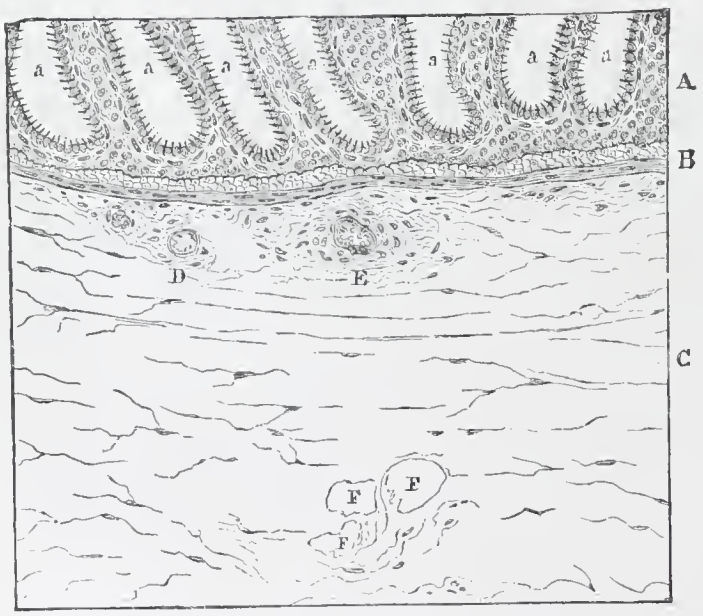
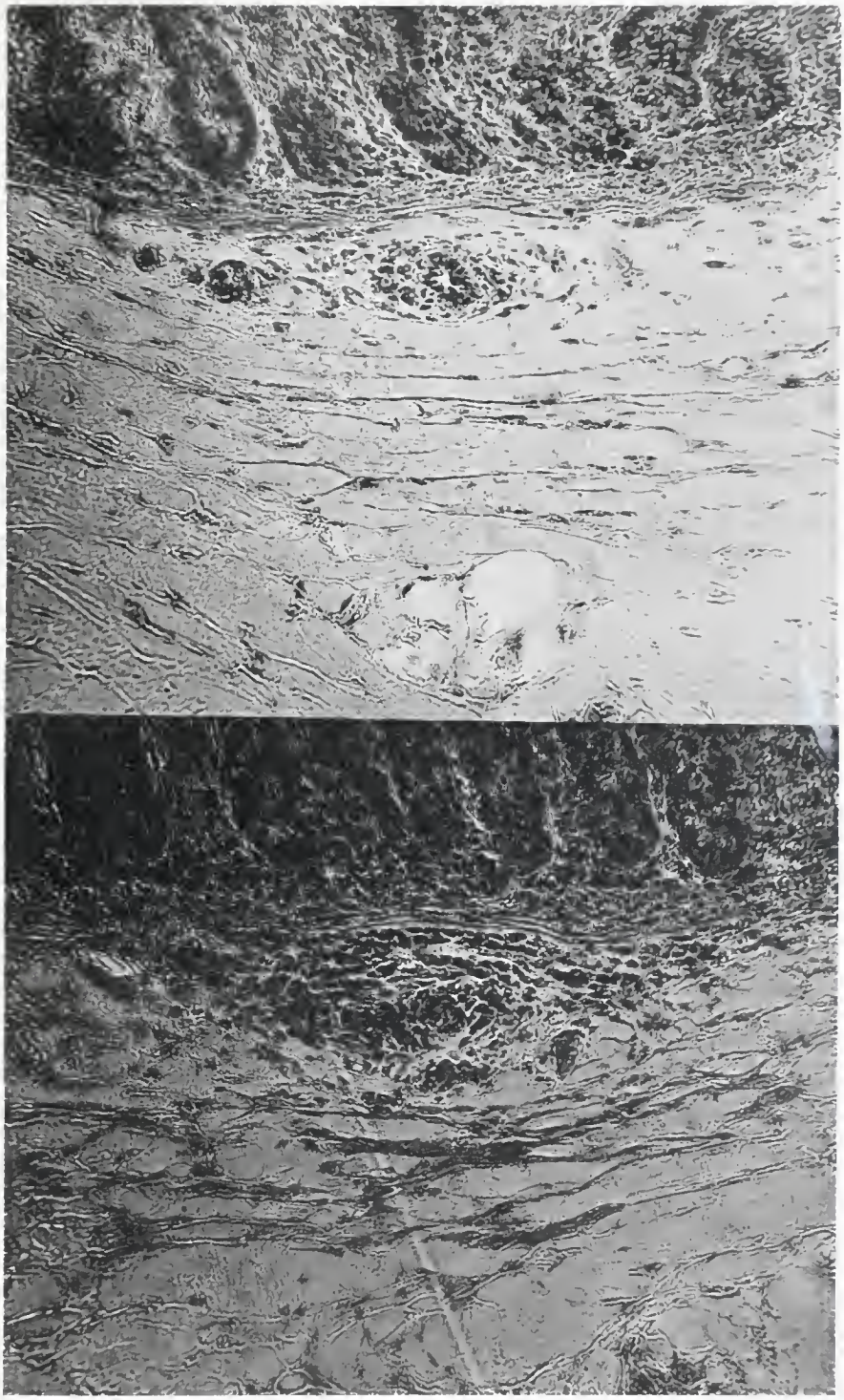



FIG. 6.—Diagram explanatory of the plate facing this page. A. Mucous membrane; *a*, *a*, *a*, *a*, follicles of Lieberkühn pushed apart by the swarm of new elements in the adenoid tissue. B. Muscle of Brücke. C. Submucous connective tissue. D. A small artery. E. A small vein surrounded by the lymphoid swarm. F, F. Accidental rents in the section. This diagram is drawn from the preparation represented in the upper figure of the plate facing this page, but will serve also to interpret the lower figure, and also the two figures in the plate facing page 334.

The plate facing page 334 reproduces two other photo-micrographs, taken with the same objective and magnifying power, from the right half of the same preparation [No.



*Heliotype.* *James R. Osgood & Co., Boston*

TWO VIEWS OF A PERPENDICULAR SECTION OF COLON.

SHOWING INFLAMMATION OF THE SUB-MUCOUS LAYER. MAGNIFIED 280 DIAMETERS.

PHOTO-MICROGRAPH BY ASSISTANT SURGEON J. J. WOODWARD, U. S. A.

From No. 668. MICROSCOPICAL SECTION.

668, Microscopical Section] in which, as mentioned, the thickening was greater and the lymphoid elements were more numerous. The upper portion of the plate represents a view very similar to that in the lower portion of the last plate, and, like it, shows an artery and vein—the latter uppermost—a short distance below the muscle of Brücke. The lymphoid swarm which densely infiltrates the submucosa is still arranged for the most part concentrically around the vein, although a considerable number of the elements are to be seen also in the vicinity of the artery. The lower portion of the plate represents another artery and vein—the artery uppermost—found still further to the right in the same piece, and a little further below the muscle of Brücke, which accordingly does not appear in the photograph. It exhibits conditions very similar to those shown in the upper portion of the plate. Certainly such conditions as are exhibited in these plates, which are constantly to be encountered in perpendicular sections of the inflamed submucous connective tissue, would appear to be best explained by supposing, in accordance with Colnheim's doctrine, that the lymphoid brood has migrated from the small veins.

In concluding this sketch of the histology of the inflamed intestines it remains to be mentioned that in the more chronic cases of intestinal catarrh without ulceration, as well as in the ulcerative cases, I have occasionally observed the so-called amyloid* degeneration in the intestinal arterioles and capillaries, especially in the villi of the small intestine, and in the submucosa both of the small intestine and of the large. Usually the process had only moderately advanced, the intima of the small arteries alone having undergone the characteristic glassy swelling, while the muscular coat was not yet involved or at least but slightly implicated. I regret that I did not during the war feel the importance of instituting systematic examinations, of all the fresh specimens at my disposal, with iodine to determine the frequency and extent of this complication, especially in view of the statement of Aitken† that he has repeatedly seen soldiers dead of diarrhœa in the hospital at Netley whose whole alimentary canal presented this lesion to a marked degree.

Amyloid degeneration of the alimentary canal was first minutely described by Virchow, though Meckel‡ had previously observed the characteristic iodine reaction in both small and large intestine. Virchow detected the change in question in the œsophagus and

* I employ the designation amyloid degeneration, introduced by Virchow, because it is that most generally in use, although it was based upon a misconception. The disease had previously been very generally called lardaceous degeneration (Speckige Entartung) in Germany, and waxy degeneration in England, on account of the physical appearance of the liver and other organs when affected by it. H. MECKEL—*Die Speck-oder Cholestrinkrankheit*, Annalen des Charité-Krankenhauses, Jahrg. IV, Heft 2 [Berlin, 1853,] S. 254—advanced the view that it was a form of fatty degeneration, the abnormal substance consisting probably of various mixtures of cholesterin and other fatty bodies. Among these he distinguished at least four substances: "Speck-roth, Speck-violet, Cholesterin and Speck-kalk;" the first two so named from their reaction with iodine. VIRCHOW—*Archiv*, Bd. VI, [1854,] S. 135, 208 and 416—relied chiefly on the reaction with iodine, with or without sulphuric acid, and his view, that the substance in question is really allied to starch in chemical composition, was for a time very generally accepted. FRIEDREICH and KEKULÉ—*Virchow's Archiv*, Bd. 16, [1859,] S. 61—however, found by actual chemical analysis of so-called amyloid masses, obtained from the spleen, that it was a nitrogenous body whose ultimate chemical composition closely resembled that of albumen; and C. SCHMIDT—*Ueber das sogenannte thierische Amyloid*—Annalen der Chemie u. Pharmacie, Bd. 109, [1859,], S. 250—by independent analyses arrived at similar results. Subsequently these results were confirmed by KÜHNE and RUDNEFF—*Zur Chemie der amyloiden Gewebsentartung*, Virchow's Archiv, Bd. 33, [1865,] S. 65—who brought forward improved methods of isolating the amyloid substance from large organs, such as the liver and spleen, thus diseased. In view of the composition thus established, the old designation "colloid," preferred by I. M. SCHRANT—*Over de goed-en kwaadaardige gezwellen*, Amsterdam, 1851, [I cite from VIRCHOW'S review in *Canstatt's Jahresbericht*, Bd. IV, [1852,] S. 315. See also, in the same publication, Bd. II, [1852,] S. 21, VIRCHOW'S review of SCHRANT'S essay *Over den oorsprong van het Colloid*, and, in Bd. II, [1851,] S. 34, his review of SCHRANT'S essay on the syphilitic liver] would seem a more appropriate designation than amyloid, were it not that there are other pathological products known as colloid which do not give the same reaction with iodine. WM. H. DICKINSON—*On the nature of the waxy, lardaceous, or amyloid deposit*, Med. Chir. Trans., 2d Series, Vol. 32, [1867,] p. 39; also by the same—*Pathology and Treatment of Albuminuria*, Amer. Ed., New York, 1868, p. 166 *et seq.*—argues that the deposit is allied in its nature to *fibrin*, from which it differs chiefly by being deficient in the fixed alkali with which the fibrin of the blood is generally associated. He states that if fibrin (or albumen) is dissolved in dilute hydrochloric acid (0.6 in 1,000) and evaporated to dryness at a low temperature, the substance obtained will react with iodine exactly like the so-called amyloid material. Albumen treated the same way gives similar results. DICKINSON proposed sulphate of indigo as an additional test for the so-called amyloid degeneration, for which he suggests the designation "depurative infiltration" on account of the conditions under which it arises.

† WM. AITKEN—*The Science and Practice of Medicine*, 3d Amer. Ed., Philadelphia, 1872, Vol. II, p. 682, Article, *Lardaceous disease of the intestines.*

‡ MECKEL, *loc. cit.*, observed the characteristic iodine reaction [his Speck-roth] in the intestinal canal in several cases, (cases 2, 3, 5 and 10 of the paper cited,) in all of which chronic disease of the bones also existed. In case 10 the change affected the minute arteries of the whole intestine.

stomach, as well as in all parts of the intestinal canal, and especially in the small intestine.* He regarded it as almost exclusively limited to the minute arterioles, especially those in the villi and the superficial layers of the submucosa, but stated that it could be followed for a short distance also along the capillaries given off from these vessels. Little alteration of the affected parts could be detected with the naked eye; the mucous membrane was merely very pale, somewhat thickened and preternaturally translucent. On the application of iodine to a portion of small intestine thus diseased, the general surface of the mucous membrane becomes yellow, while numerous reddish or brownish points make their appearance. These are the intestinal villi whose vessels have undergone the amyloid change. In like manner the affected vessels assume the characteristic color with iodine in the submucosa of both small and large intestine. Virchow states that he has seen cases in which the whole digestive tract from the mouth to the anus possessed no single arteriole which was not thus diseased.

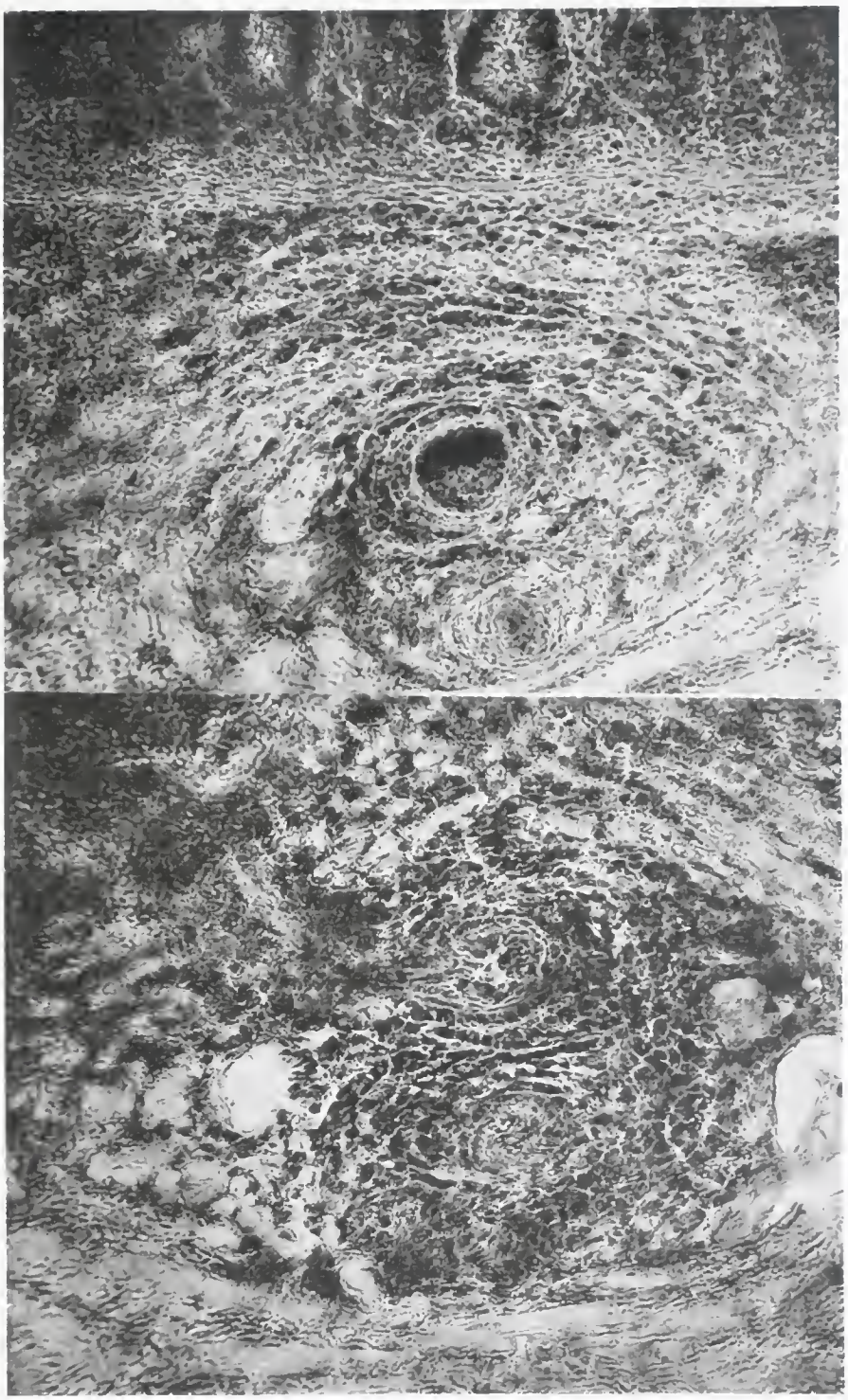
Since attention was first directed to this subject additional observations have been published by various authors, especially by Friedreich, Beckmann, Neumann, Lambl, Frerichs, Hayem and Stewart.† Lambl has shown that the process is not limited to the bloodvessels of the intestine, but that all the muscular tissues of the intestine, as well as the epithelium of the mucous surface‡ of the villi, of the follicles of Lieberkühn, and even the peritoneal epithelium, are also involved. Hayem mentions the occurrence also of "amyloid concretions" in the closed follicles. In all these cases the amyloid disease of the intestines was associated with amyloid disease of other parts of the body, especially of the liver, spleen and kidneys. According to Hayem the disease in these organs is usually more advanced than in the intestine, whence he infers that the latter is a secondary affection. The cases of Meckel and the earlier cases of Virchow all occurred in subjects who had suffered from chronic disease of the bones, especially caries and necrosis. This was true also of one of the cases of Frerichs and of all the cases of Hayem. Virchow at first too exclusively emphasized this connection. Subsequently he himself reported a case in which it did not exist.§ Secondary syphilis without bone disease, (Friedreich, Frerichs, Stewart,)

* R. VIRCHOW—*Ueber den Gang der amyloiden Degeneration*, Virchow's Archiv, Bd. VIII, [1855,] S. 364. VIRCHOW states in this paper that Dr. JOCHMANN was the first to observe the iodine reaction on the mucous membrane of the stomach, and that he himself, pursuing the investigation, arrived at the results stated in the text. I do not know that JOCHMANN's investigations were ever published, nor have I found any mention of amyloid degeneration of the intestinal canal in VIRCHOW's earlier papers on that form of disease. A summary statement of Virchow's views on this subject will be found in *Die Cellularpathologie*, Berlin, 1858, S. 340. In the 4th edition of this work [Berlin, 1871, S. 445] he recommends the use of acetic acid after the iodine solution to ensure the success of the reaction. See also an additional case observed by VIRCHOW, in which there was no bone affection—*Neue Beobachtungen über amyloide Degeneration*, Virchow's Archiv, Bd. XI, [1857,] S. 188.

† N. FRIEDREICH—*Einige Fälle von ausgedehnter amyloider Erkrankung*, Virchow's Archiv, Bd. XI,[1857,] S. 387; also an additional case, *op. cit.*, Bd. XIII, [1858,] S. 498. In these cases there was either general tuberculosis or secondary syphilis; bone disease in none. In two of the cases extensive amyloid degeneration of the intestinal vessels was observed. O. BECKMANN—*Ein Fall von amyloider Degeneration*, Virchow's Archiv, Bd. XIII, [1858,] S. 94; E. NEUMANN—*Neue Beobachtungen über amyloide Degeneration*, Deutsche Klinik, Bd. XII, [1860.] S. 337, 353 and 373—relates eight cases of more or less extensive amyloid disease in all of which the intestinal tract was involved. In five of these cases tubercular disease of the lungs, &c., coexisted. One case (No. 6) was a sailor who had contracted dysentery in Java, since which for three-quarters of a year he had suffered from chronic flux. Numerous follicular ulcers of the colon were found during the autopsy, together with amyloid degeneration of the small arteries of the liver and both small and large intestines; also commencing amyloid degeneration of the cells of the splenic pulp. LAMBL—*Beob. u. Studien.* [aus dem Prager Kinder-Spitale,] Prag, 1860, S. 319, *Ueber amyloide und colloide Degeneration im Allgemeinen und die des Darms insbesondere*—has described this lesion with great detail as observed by him in the intestines of children dead of intestinal catarrh and other wasting diseases. He observed the amyloid change not merely in the bloodvessels, but in the muscular coat of the intestines, the muscular fibre-cells of the villi, the epithelium of the villi, of the follicles of Lieberkühn, and of the peritoneum. The appearances are figured in a colored lithographic plate, Taf. 16. FRERICHS—*Diseases of the Liver*, Transl. of New Syd. Soc., London, 1861, Vol. II. p. 180 *et seq.*, especially Obs. 27 and 28, both syphilitic cases; in the first, syphilitic ulceration of the left parietal bone existed. M. G. HAYEM—*Note sur la déjénérescence amyloïde du tube digestif*, Compte Rendu des Séances de la Soc. de Biologie, Nov., 1865, 4me Série, T. II, Année, 1865, p. 191; also Gaz. Méd. de Paris, T. 21, [1866,] p. 99; and Biennial Retrospect of New Syd. Soc. for 1865-6, p. 176. This author found amyloid disease of the intestines in five out of forty scrofulous children, all having chronic suppuration of the bones with or without tuberculosis. The observations were made in the Hôpital des enfans malades at Paris. T. GRAINGER STEWART—*On hæmorrhage from waxy or amyloid degeneration*, British and Foreign Med. Chir. Rev., Vol. 41, [1868,] p. 201. This paper contains the details of three cases in which amyloid disease of the intestines was found on post mortem examination. All syphilitic—no bone disease.

‡ This observation is also corroborated by RUDNEFF—*Amyloidentartung der Bauchorgane*, Virchow's Archiv, Bd. 33, [1865,] S. 76.

§ The last case cited in the previous note. See also an interesting discussion of the relations of amyloid degeneration to syphilis by the same author—*Ueber die Natur der constitutionell-syphilitischen Affectionen*, Virchow's Archiv, Bd. 15, [1858,] S. 217.



*Heliotype.* *James R. Osgood & Co., Boston.*

TWO VIEWS OF A PERPENDICULAR SECTION OF COLON.

SHOWING MORE ADVANCED INFLAMMATION. MAGNIFIED 280 DIAMETERS.

PHOTO-MICROGRAPH BY ASSISTANT SURGEON J. J. WOODWARD, U. S. A.

From No. 668. MICROSCOPICAL SECTION.

general tuberculosis, (Friedreich, Neumann,) and other wasting diseases, (Virchow, Neumann, Lambl,) may induce the general amyloid disease of which the intestinal lesion is only a part.

It is reasonable to believe with Virchow* that this lesion must produce serious disturbance of the functions of the intestinal canal. Its relations to the inflammatory conditions of the intestinal mucous membrane, with which it is so often associated, are less obvious. According to Hayem these inflammatory conditions are the consequence of the amyloid disease. He describes accordingly a "*psorentérie amyloïde*"† which terminates in amyloid erosions and ulcerations. It is not clear, however, that the intestinal inflammation is not the antecedent condition which determines the invasion of the intestinal vessels in some cases of general amyloid disease, while they escape in others. So also, according to Colberg,‡ amyloid disease of the intestinal mucous membrane precedes and determines the formation of the intestinal ulcers which so often occur, quite independently of any tubercular disease of the intestine, in cases of chronic ulcerative pneumonia; but in these cases, as Colberg himself does not omit to state, the ulceration is always associated with intestinal catarrh, and it may well be questioned whether this is not the true cause both of the ulceration and the coexisting amyloid disease. Stewart§ has given prominence to the occurrence of hæmorrhage in amyloid disease which had previously been observed by Hayem and Wilson Fox.‖ According to him, next after the spleen the most common seat of such hæmorrhages is the intestinal tract, where it occurs independently of any visible ulcerative process, and probably depends upon rupture of the diseased capillaries. He does not, however, regard hæmorrhage from this cause as necessarily a dangerous accident, remarking that sometimes it comes and goes for years without markedly depressing the vital powers.

Diarrhœa is another symptom attributed to amyloid disease of the intestines by Virchow, Hayem and others. It is not clear, however, that it occurs unconnected with more or less pronounced intestinal catarrh, which so generally coexists to a marked degree. Further observations on this point, and also with regard to the frequency of the disease, are much to be desired;¶ meanwhile, in the present imperfect condition of our knowledge of the nature of the amyloid change, it appears premature to introduce into our nomenclature a new species of diarrhœa based upon the existence in the intestinal coats of this ill-understood anatomical lesion.

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* *Die Cellularpathologie*, loc. cit., *supra*.

† *i. e.* An intestinal catarrh with enlargement of the solitary follicles. HAYEM'S account of this process has been largely drawn upon by AITKEN (*loc. cit., supra*) in his description of lardaceous disease of the intestines. I am unable to see that either the first or second stage of the process described differs from what may be observed in ordinary intestinal catarrh except in the presence, in addition to the other lesions, of the amyloid disease of the intestinal bloodvessels.

‡ COLBERG—*Beiträge zur normalen und path. Anat. der Lungen*, Deutsches Archiv für klin. Med., Bd. II, 1867, S. 478—observed the amyloid change in the capillaries of the villi and of the mucosa in the margins of the intestinal ulcers referred to in the text. He explains the mode in which such ulcers commence by supposing the villi to become stiff and brittle in consequence of the amyloid condition of their capillaries, and thus prone to break down before the mechanical violence of the passage of the intestinal contents, ("den mechanischen Insulten der Ingesta.") If the intestinal contents are mingled with the products of urea-decomposition, as often occurs when amyloid kidney disease coexists, the chemical action of the ammoniacal compounds is superadded.

§ *Loc. cit., supra.* STEWART concludes: "1. That hæmorrhage is not a very infrequent consequence of waxy or amyloid degeneration of vessels," which AITKEN, *loc. cit.*, p. 684, by some mistake renders: "I. That it is not a frequent occurrence."

‖ HAYEM—*loc. cit., supra.* WILSON FOX—*Case of fatal purpura associated with waxy degeneration of the striated muscles, and also of the vessels in the affected parts*, British and Foreign Med.-Chir. Rev., Vol. 36, [1865,] p. 481.

¶ E. WAGNER—*Beiträge zur Kenntniss der Speckkrankheit, insbesondre der Speckleber*, Archiv der Heilkunde, Jahrgang II, [1861,] S. 481—states that in 1,200 autopsies made by him between September 30, 1856, and May 24, 1861, he found one or more organs affected by this condition in 48 cases. Of these, 16 were consecutive to suppuration of the bones; 27 to chronic lung tuberculosis; 3 to ulcerative cancer, and 3 to syphilis—in one case complicated with cancer. The paper concludes with a bibliography of the subject. On the subject of the affections which precede the development of amyloid or lardaceous disease generally the reader may advantageously consult S. WILKS—*Cases of lardaceous disease and some allied affections*, Guy's Hospital Reports, 3d Series, Vol. II [1856,] p. 103; T. GRAINGER STEWART—*On the waxy or amyloid form of Bright's disease*—Edinb. Med. Journ., Vol. VI, 2, [1861,] p. 710; *Further observations* on the same, same Journ., Vol. X, 1, [1864,] p. 97; and *On the diagnosis of the forms of Bright's disease*, British and Foreign Med.-Chir. Rev., Vol. 38, [1866,] p. 196; DICKINSON, *op. cit., supra*, p. 333; and E. KYBER—*Studien über die amyloide Degeneration*. Dorpat, 1871. The account given in the last treatise of the use of reagents, especially of iodine and sulphuric acid, in the diagnosis of the amyloid lesion, deserves attention. The work of A. PAGENSTECHER—*Ueber amyloide Degeneration*, Würzburg, 1858—I have been unable to see.

## 2. Acute Dysentery.

Acute dysentery,* because of its frequency, painfulness and fatality, has occupied a large share of the attention of medical writers since the time of Hippocrates, who described, under the designation *Δυσεντερία*, essentially the same disease which has been known ever since by that name.† With the revolutions of medical knowledge the precise limitations assigned to the use of the term have been considerably modified, and accordingly the various definitions of dysentery, with which medical literature abounds, are by no means strictly accordant. They vary in part because of the various degrees of extension given to the use of the name, and in part because certain writers have predicated of the disease in general symptoms peculiar to the particular group of cases which fell under their own observation. Without discussing these various definitions, some of the more important of which are given below in a foot-note,‡ and without venturing to offer any new definition,

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* Synonyms: Δυσεντερία, [Hippocrates, Galen and other Greek writers:] Ῥεῦμα γαστρός, [Galen—*I Com. in Prog. Hip.*, § 8, Ed. Kühn, Tom. XVIII, B, p. 33;] Tormina, [Celsus:] Rheumatismus intestinorum cum ulceratione; [Cælius Aurelianus:] Difficultas intestinorum; Fluxus dysentericus, [Lamonière—*Obs. Flux. dysent.*, Lyons, 1626;] Flumen dysentericum; Fluxus cruentus cum tenesmo; Tormentum intestinorum; Alvi fluxus torminosus; Febris dysenterica; Catarrhus intestinorum spasmodicus; Colo-typhus, [Eisenmann—*Die Krank. Familie Typhus*, Erlangen, 1835, S. 362;] Colonia, [Craigie—*Pract. of Phys.*, Edinb., 1837, Vol. I, p. 902:] Dysenterie, Flux de sang, [French writers;] Colite, [Broussais;] Dysentery, Bloody flux, [English writers;] The griping of the guts, [Willis—*Pharm. Rat.*, Sect. III, Cap. 3 ] Ruhr., [Germae:] Disenteria. [Italian.] Sauvages—*Nos. Meth.*, Amsterdam, 1763, Tom. II. p. 324—enumerates among the synonyms the morbus dissolutus of Paracelsus, but it is clear that Paracelsus—*Lib. XIV Paragraphorum*, Lib. I, De Morbo dissoluto, and, *In Lib. XIV Par. Commentaria*, Opera omnia, Geneva, 1658, Tom. I, pp. 491 and 539—rather intended to indicate by morbus dissolutus a genus of which dysentery, lientery, diarrhœa, vomiting, and even certain disorders of the urine were species. He says (Cap. I, Par. I,) "Omne quod perfectum et per stomachum indigestum abit, morbus dissolutus est: et illud quod à perfecto ad imperfectum descendit, dissoluti materia cruda et non præparata est, et cruda à præparatis. Centrum stomachus est, exitus per annum, per vomitum et vesicam." Whichever road the flux might take, there were three species, (Cap. I, Par. III,) "Tres sunt morbi ex dissolutione, vel dissolutis primæ speciei, rubeus, albus et laxus."

† See, for example, the account given by Hippocrates of the dysentery of the island of Thasus—*Epidemics*, Lib. I, Sect. 2, [Ed. Littré, Tom. II, p. 617 *et seq.*,] and Lib. III, Sect. 3, [Ed. Littré, III, pp. 87–89.] Compare also the treatise on *Airs, Waters and Places*, § 7 and 10, [Ed. Littré, II, pp. 27 and 43;] *Aphorisms*, Sect. III, 22, and Sect. IV, 24 and 26, [Ed. Littré, IV, pp. 497 and 511,] and many other places, to some of which allusion will be made in subsequent notes. I have preferred, in quoting Hippocrates in these notes, to give references as a rule to the Greek-French edition of É. Littré *Œuvres Complètes d'Hippocrate*, Paris, 1839–1861, (ten vols. 8vo.,) which is not only easily accessible, but has many advantages from the critical acumen of the editor, whose admirable French translation is also a great convenience to most modern readers. The English translation of Dr. Francis Adams, [Printed for the Sydenham Society, London, 1849,] which I have used with great pleasure on many occasions, has the disadvantage that it contains but a portion of the Hippocratic writings. Among the older Greek-Latin editions of Hippocrates contained in the Surgeon General's library, I have frequently consulted with advantage the original edition of Anutius Foes [Francofurti, apud Andreæ Wechelì heredes, 1595,] and the Geneva reprint, [S. Chouët, 1657,] which, on account of its more convenient paging and various additions in the way of annotations, is perhaps to be preferred. That the word dysenteria was used familiarly in the same sense as at present, at the time of Hippocrates or even earlier, is shown by the passage in the history of Herodotus, [Lib. VIII, Cap. 115,] which describes a pestilence and dysentery [λοιμὸς καὶ δυσεντερίη] that decimated the army of Xerxes while retreating through Thessaly.

‡ The following definitions from Hippocratic writings of doubtful origin, harmonize well with the descriptions and allusions scattered through the genuine books. In *Regimen*, (*De victus rat.*,) Lib. III, [Ed. Littré, VI, p. 617,] after stating that diarrhœa is one of the consequences of habitually taking too much food in proportion to the amount of exercise used, we are told that so long as putrescent alimentary matters only are passed from the bowels the disease is called diarrhœa; "But when, the body being heated, acrid matters are discharged, the intestine is excoriated, ulcerated, and the stools are bloody; this is dysentery, a grave and dangerous disease." So also in the treatise on *Affections*, [Ed. Littré, VI, p. 235,] "When there is dysentery, pain occupies the whole abdomen; bile, phlegm and heated blood are discharged." Celsus—*Medicinæ Libri Octo*, Lib. IV, Cap. 15, [Leyden Edit. of 1785, p. 179]—gives a short description which may be taken as a definition: "The next disease of the intestines is usually called tormina: in the Greek language it is termed dysenteria. The intestines are ulcerated internally; grumous evacuations come from them; sometimes the excretions are mixed with fæcal matter always liquid, at other times the discharges are slimy; sometimes particles like flesh pass with them: there is a frequent desire of going to stool, and pain in the anus: with this pain a small portion is voided; and even by this the pain is augmented; that is relieved after some time; and then there is a short repose: the sleep is interrupted; slight fever ensues, and in the progress of time, that disease either destroys the patient, when it has become inveterate, or even although it may be terminated, exerts a baneful influence for a long time." [Lee's Translation, London, 1831.] Aretæus briefly affirmed that the different forms of intestinal ulcers constitute dysentery—*De Causis et Signis Morborum Diuturnorum*, Lib. II, Cap. IX, [Boerhaave's edition of Aretæus, Leyden, 1731, p. 59.—See also the English translation of T. F. Reynolds—American reprint, Philadelphia, 1841, p. 72]—and a similar definition, with the addition that the ulcer is produced by external causes, was given by Archigenes, if indeed he has been correctly reported by Ætius.—*Contractæ ex veteribus medicinæ tetrabiblos*. Translation of J. Cornarius, Basel, 1542, Tetrab. III, Serm. I, Cap. 43. [I cite the Lyons edit. of 1549, p. 599.] The definition given by Galen in the treatise *De Locis Affectis*, Lib. I, Cap. 2, [Ed. Kühn, VIII, p. 381,] is conceived in the same spirit "In the present work we should understand the name dysentery properly, that the appellation signifies an ulceration of the intestine;" and, further on—"At first there is an excretion of very biting (*i. e.* corrosive) bile; then shreds of the intestines follow; afterwards a little blood is discharged along with the shreds, and now the affection is dysentery." Compare the Galenical treatise on *Definitions*, which, however, Kühn [Tom. I, p. CLIX] does not regard as genuine. "Dysentery is an ulceration of the intestines, with an excretion of phlegm and bloody material, or of shreds resembling lees, and accompanied by griping and pain in the abdomen and bowels."—[Ed. Kühn, XIX, p. 421.] In these and subsequent citations from Galen, I quote from Kühn's Greek-Latin edition, [Leipsic, 1821–33, 20 vols. 8vo.] Among the other editions in the library of the Surgeon General's office, I have also sometimes used with advantage the 3d edition apud Juntas, Venice, 1556, chiefly on account of the unrivalled index of Brasavolus, and the Greek-Latin edition of Hippocrates and Galen, by R. Charterius, [Paris, 1679.] The French translation of Ch. Daremberg [Paris, 1856] has also been of use to me, and I regret that it represents so few of the Galenical books. The Hippocratic conception of dysentery differed somewhat from our modern notions, since a part of the cases which would now be included under the head of dysentery were then spoken of as tenesmus. Compare the account of tenesmus in the treatise on *Affections* [Ed. Littré, VI, p. 229] with such passages as that in *Diseases*, Lib. I, [Ed. Littré, VI, p. 147,] where it is said that a tenesmus may

it seems most convenient for the purposes of this work to embrace under the designation acute dysentery all the various forms of acute alvine flux, whether mild or severe, in which tenesmus is a prominent symptom. Tenesmus arises whenever the inflammation of the mucous membrane upon which the flux depends affects the descending colon and rectum with sufficient intensity to make the expulsive efforts painful. Mere intensity in the inflammatory process does not determine dysentery rather than diarrhœa, unless the descending colon and rectum are affected, and on the other hand comparatively slight inflammation of the mucous membrane of this region may give rise to dysenteric symptoms; but it is worthy of note that the more severe forms of acute inflammation of the intestinal mucous membrane are exceedingly prone to involve this portion of the canal also, and thus produce dysentery much more frequently than diarrhœa.

change into a dysentery, or that in *Epidemics*, Lib. II, Sect. 2, [Ed. Littré, V, p. 91,] in which it is asserted that those who already suffer from tenesmus are especially liable to dysentery. This distinction, which was doubtless much older than HIPPOCRATES, is satisfactorily accounted for by GALEN, who tells us, in his second commentary on the Hippocratic treatise just cited—*Hippocrates Epidem. II, et Galeni in illum Commentarius* II, § 17 [Ed. Kühn, XVII, A, 317]—that the ancient physicians named some diseases from the parts affected as ophthalmia, dysentery, &c., and others from the symptoms, as ileus, tenesmus, &c. CELSUS also describes tenesmus as a separate affection—*Medicina*, Lib. IV, Cap. 18, [Leyden Edit. of 1785, p. 183.]—and GALEN does the same, as in *De Locis Affectis*, Lib. VI, Cap. 2, [Ed. Kühn, VIII, p. 383] and other places; but ARETÆUS merely describes it as a symptom of dysentery. [Boerhaave's Edit., p. 60.] GALEN also more sharply separated the hepatic flux from dysentery than his predecessors had done. Consult for example, the passages just cited in *De Locis Affectis*, and *Com. II in Hippoc. Epidem. II.* He describes at length four varieties of bloody stools: 1, those proceeding from plethora, as in the case of those who have lost limbs, or in whom habitual hæmorrhages are suppressed; 2, those due to hepatic trouble, (the hepatic flux,) in which the stools resemble the washings of flesh; 3, those due to black bile, (ex melancholia,) and, 4, those due to ulceration of the intestine, which alone is properly to be called dysentery. Compare *De Sympt. Causis*, Lib. III, Cap. 7, [Ed. Kühn, VII, p. 246,] with the passage cited above in *Com. II, in Hippoc. Epidem. II.* GALEN tells us that all the physicians of his own time, and most of the ancient ones, limited the use of the term dysentery to cases in which the intestines are ulcerated—*De Locis Affectis*, Lib. II, Cap 5, [Ed. Kühn, VIII, p. 85;] but elsewhere—*Com. IV, in Hip. de Articulis liber*, § 33, [Ed. Kühn, XVIII, A, 724,]—he shows that Hippocrates included all kinds of bloody discharges from the bowels under the designation dysentery. GALEN's four varieties of bloody stools long figured in medical literature. Compare, for example, P. FORESTUS—*Obs. et Cur. Med.*, Lib. XXII, Leyden, 1593, Obs. 31, Scholia, p. 344; HOLLERIUS—*De Morb. Intern.*, (1565,) Lib. I, Cap. 43, (ejusdem Hollerii Scholia,) in Opera, Paris, 1654, p. 341; G. FAB. HILDANUS—*De Dysent.*, (1602,) Cap. I, [in Opera, Frankfort, 1646, p. 667;] L. RIVERIUS—*Prax. Med.*, (1640.) Lib. X, Cap. 6, [in Opera, Lyons, 1679, p. 300;] and ROLFINCIUS—*Epit. Meth. Cognoscend. et Cur.*, &c., Jena, 1655, Lib. III, Cap. 17, p. 291—a list which might readily be greatly extended. CÆLIUS AURELIANUS defined dysentery as rheumatism of the intestines with ulceration—*De Morb. Chron.*, Lib. IV, Cap. 6, [J. C. Amman's edit., Amsterdam, 1709, p. 524.]—He did not treat of tenesmus as a separate affection, but preferred to embrace it under the head of dysentery. According to PAULUS ÆGINETA, dysentery is an ulceration of the intestines, sometimes arising from tenesmus or some form of bowel complaint, sometimes being itself the primary disease—Lib. III, Cap. 42, [*Totius Rei Medicæ, Libri VII*, Latin version of J. Cornarius, Basel, 1556, p. 111, or English translation of Francis Adams, Sydenham Society, London, 1844, Vol. I, p. 525.]—Tenesmus he treats as a separate affection—Lib. III, Cap. 41—and describes hepatic dysentery quite after the Galenical view. Compare Cap. 46. GORDONIUS—*Lilium Medicinæ*, Venice, 1496, Part. V, Cap. XIV, Fol. 161—"Dissinteria est fluxus sanguineus cum excoriatione et ulceratione intestinorum." FERNELIUS defined dysentery as bloody stools, with pain and griping of the bowels—"Cruenta alvi dejectio cum dolore et ventris torsione"—*Medicina, Pathologia*, Lib. VI, Cap. 10, [Paris edit. of 1554, p. 187.] LOMMIUS—*Obs. Med.*, Antwerp, 1550, Lib. II, fol. 62—as "Cruenta alvi dejectio, cum ulcere intestinorum, cum dolore et torsione." FABRICIUS HILDANUS as a bloody flux of the bowels, "De Dysenteria, hoc est, Cruento Alvi Fluore," and thought it was best to include all kinds of bloody stools under the name, "Omne cruentum alvi profluvium ex quacunque causa." He describes the four varieties of GALEN, and follows him in regarding the last as dysentery proper—*De Dysenteria*, Liber Unus, in Opera, Frankfort, 1646, p. 666. DANIEL SENNERTUS remarks: "Dysentery consists of frequent and bloody dejections from the bowels, with pain in the abdomen and ulceration of the intestines; or it is an ulceration of the intestines with frequent bloody and purulent dejections, with pain in the abdomen and griping, arising from an acrid matter peculiarly adverse to the intestines and eroding them."—*De Dysenteria Tractatus*, Wittenberg, 1623, p. 2; also *Pract. Med.*, Lib. III, Pars II, Sect. II, Cap. 7, [in Opera Omnia, Paris, 1641, Tom. III, p. 123.] SYDENHAM says: "I discovered that it was a fever—a fever, indeed, of a kind of its own—turned inwardly upon the bowels."—*Obs. Med. circa Morb. Acut. Hist. et Curat.*, Sect. IV, Cap. 2, [Opera Medica, Geneva, 1736, Tom. I, p. 111. Latham's Eng. transl., Sydenham Society, London, 1848, Vol. I, p. 165.] FRID. HOFFMANN classed dysentery among the spasmodic and convulsive affections, and defined it thus: "It is, in truth, nothing else than the peristaltic motion of the intestines augmented to a convulsive degree, in consequence of an caustic, ulcerating humor adhering to their coats, and producing a frequent desire of going to stool, these dejections being frequent, consisting of a foul muco-bilious matter, stained with more or less blood or sanies, and accompanied by violent gripings and by febrile disturbance."—*Med. Rat. Syst.*, Tom. IV, Pars III, Sect. II, Cap. 7, [Opera, Geneva, 1740, Tom. III, p. 151.] The definition of SAUVAGES was: "Frequent griping, muco-bloody dejections from the bowels—(Frequens tormina mucoso-cruenta alvi dejectio.")—*Nos. Meth.*, Amsterdam, 1768, Vol. II, p. 324. He treated of Hepatirrhœa, (the hepatic flux,) Melæna and Tenesmus under separate headings. J. C. NYANDER defined dysentery as a scabies of the intestines, and his thesis, *Exanthema Viva*, having been published by LINNÆUS—*Amœn., Acad.*, Tom. V, (1760,) p. 92—and the imaginary acarus having been described by the great naturalist in the 12th edition of the *Syst. Nat.* [Stockholm, 1767, Tom. I, Pars II, p. 1024] under the designation Acarus Dysenteriæ, NYANDER's definition has been very generally attributed to him. In his *Genera Morborum*, (Upsal, 1763,) Linnæus himself defined dysentery as "Diarrhœa cruenta cum Colica, Tenesmo."—I quote from the *Synopsis Nos. Meth.* of CULLEN, Amsterdam, 1775, p. 68. According to CULLEN, dysentery is "a contagious fever; with frequent mucous or bloody stools, the fæces being generally retained; tormina and tenesmus"—(Pyrexiæ contagiosa; dejectiones frequentes, mucosæ, vel sanguinolentæ, retentis plerumque fœcibus alvinis; tormina; tenesmus)—*Synopsis Nos. Method.*, Amsterdam, 1778, p. 192.—CULLEN classed dysentery among the fevers—*loc. cit.*—See also *First Lines*, Book V, Chap. 2, [Thomson's Ed. of the Works of Cullen, Edinb., 1827, Vol. II, p. 319,] while he placed diarrhœa among the spasmodic affections. [Thomson's Ed., Vol. II, p. 479.] MAXIMILIAN STOLL, like CÆLIUS AURELIANUS, described dysentery as a "rheumatism of the intestines."—*Ratio Medendi*, Pars III, Sect. 4, *De Natura et Indole Dysenteriæ Commentatio*, Vienna, 1780, p. 251 *et seq.* FOURNIER et VAIDY, "On entend par dysenterie une affection qui se reconnait aux caractères suivans: tranchées, ardeur dans le gros intestin, épreintes, ténesme, besoin fréquent, irrésistible et parfois continuel d'aller à la selle, accompagné de violens efforts; evacuation, en très petite quantité, d'une matière muqueuse ou puriforme, souvent mêlée de sang; d'autres fois, purement sanguinolente. Odeur spécifique, extrêmement fétide et nauséabonde des déjections. Fièvre dans la plupart des cas."—*Dict. des Sci. n. Med.*, Paris, 1815, T. 10, p. 510. P. VIGNES, "On entend par dysenterie, cette maladie qui consiste dans une phlegmasie, ou inflammation des gros intestins, et qui offre, pour caractères particuliers des tranchées plus ou moins fortes et fréquentes, ayant en général leur siége dans le trajet du côlon transverse; et au bas du rectum, des épreintes ou ténesme, avec des envies fréquentes d'aller à la garde-robe, et des efforts quelquefois inutiles."—*Traité Complet de la Dys. et de la Diarrh.*, Paris, 1825, p. 194. BROUSSAIS defined dysentery as the highest degree of colite, saying, in his account of that inflammation: "Dans son plus haut degré, qui est décrit par tous les

Tenesmus, then, may be conveniently regarded as the pathognomonic symptom in making the distinction between diarrhœa and dysentery, both of which, after all, depend upon different degrees of the same morbid processes;* but even the ancients avoided the error of supposing tenesmus to be a symptom of dysentery alone,† and the systematic writers of the sixteenth and seventeenth centuries, such as Nicholas Piso, Fabricius Hildanus, Felix Plater and Daniel Sennert, correctly enumerated various local causes, such as hemorrhoids, ascarides, ulcers of the rectum, fissure of the anus, stone in the bladder, tumors of adjacent parts, as of the uterus, &c.,‡ by which tenesmus may be produced independently of dysentery. Of course the presence of any of these local conditions must be taken into consideration in making a diagnosis.

The morbid conditions observed in the intestinal mucous membrane after death from acute dysentery suggest a division of the cases into two groups. In the first, the mucous membrane is in a state of ordinary acute inflammation, differing in no essential particular from that which occurs in diarrhœa, except that the inflammatory process is more pronounced in the lower colon and rectum than it is in diarrhœa; in the second, the mucous membrane is affected by a peculiar form of inflammation which may be described as pseudomembranous or diphtheritic. The lesions belonging to the first class exist, as a rule, in the milder, those of the second in the severer, forms of dysentery; the cases belonging to the first group yield readily to medication, indeed, would probably, in the majority of instances, recover without medication; those belonging to the second are exceedingly intractable, and very often prove fatal in spite of the best efforts of the medical attendant. The division of acute dysentery into two varieties, (*a*) simple inflammatory, or catarrhal dysentery, and (*b*) diphtheritic dysentery, which is suggested by anatomical considerations, is therefore warranted by clinical experience. It is true that it is not always possible during life to distinguish between these two forms of dysentery, and that both clinical and anatomical considerations make it highly probable that cases of the simple inflammatory variety often pass into the diphtheritic form in their later stages, yet

auteurs sous le nom de dysenterie, le malade est tout-à-coup saisi de tranchées violentes, suivies de selles, d'abord stercorales, ensuite muqueuses, bilieuses, sanguinolentes, et en même temps d'efforts très douloureux qu'on appelle ténesmes."—*Hist. des Phlegmasies*, 3ème Édit., Paris, 1822, Tome III, p. 49. CHOMEL et BLACHE, "On donne généralement le nom de dysenterie à une des formes de l'entérite, dont les symptômes particuliers sont le besoin répété ou même presque continuel d'aller à la selle, des douleurs cuisantes et une chaleur vive au dessus de l'anus, qui augmentent, dans les efforts, l'excrétion fréquente, laborieuse de mucus sanguinolent, quelquefois vitré, de sérosité rougeâtre, rendus presque toujours en petite quantité à la fois."—*Dict. de Méd.*, Tome 10, Paris, 1835, p. 544. J. BROWN, "Frequent mucous or muco-sanguinolent stools, pain in the abdomen, griping and tenesmus, generally accompanied with pyrexia."—*Cycl. of Prac. Med.*, Vol. I, Amer. Ed., Philadelphia, 1845, p. 720. COPLAND, "Tormina, followed by straining and scanty mucous and bloody stools, containing little or no fæcal matters; and attended by febrile disturbance."—*Dict. of Pract. Med.*, Vol. I, London, 1858, p. 693. J. DELIOUX DE SAVIGNAC, "La dysentérie est une maladie douloureuse et grave, caractérisée symptomatiquement par des coliques, des épreintes, du ténesme, avec production d'une matière spécifique muco-sanglante au début et flux séro-bilieux plus ou moins considérable ultérieurement; elle a pour caractère anatomique une phlogose du gros intestin, qui, frappant d'abord la muqueuse, peut ensuite en attaquer toutes les tuniques, et tend à l'ulcération, à la suppuration, ou à la gangrène."—*Traité de la Dysentérie*, Paris, 1863, p. 5. A. BARRALLIER, "La dysenterie est une maladie spécifique de nature infectieuse, ayant pour principaux symptômes: une douleur abdominale plus ou moins intense avec envies incessantes d'aller à la selle, accompagnée d'un sentiment très-pénible de tension et de cuisson à la région recto-anale (ténesme);—des évacuations peu abondantes de matières liquides non fécales, le plus souvent mêlées à une quantité plus ou moins considérable de sang;—un mouvement fébrile très-variable dans son intensité et sa continuité;—un amaigrissement rapide et très prononcé;—une grande tendance aux récidives et à la chronicité, surtout pour les dysenteries endémiques;—et caractérisée anatomiquement par des lésions ayant leur siége principal dans le gros intestin."—*Nouv. Dict. de Méd. et de Chir. Prat.*, T. XI, Paris, 1869, p. 714. S. JACCOUD, "La dysentérie est une COLITE ULCÉRO-MEMBRANEUSE TRANSMISSIBLE, caractérisée par du ténesme, des épreintes, l'excrétion répétée de mucosités sanguinolentes, et un état général plus ou moins grave."—*Traité de Path. Interne*, 2me Édit., Paris, 1872, T. II, p. 326. G. B. WOOD, "Dysentery is inflammation of the mucous membrane of the colon and rectum, characterized by small mucous or bloody evacuations, griping pains in the abdomen, straining at stool, and tenesmus. Inflammation in the colon, without these phenomena, would rank under enteritis."—*Prac. of Med.*, 6th Ed., Philadelphia, 1866, Vol. I, p. 712. AITKEN, "An infectious febrile disease, accompanied by tormina, followed by straining, and scanty mucous or bloody stools, which contain little or no fecal matter. The minute lenticular and tubular glands of the mucous membrane of the large intestines, with the intertubular connective tissue, are the chief seats of the local lesion, which sometimes extends into the small intestine beyond the ileo-colic valve: as in cases in which scorbutus is a predisposing cause."—*Science and Pract. of Med.*, 3d Amer. Ed., from 6th Lond. Edit., Philadelphia, 1872, Vol. II, p. 634.

* This relationship did not escape the author of the Hippocratic treatise *On Affections:* "These diseases, dysentery, lientery and diarrhœa, are similar."—*De Affect. Liber* [Ed. Littré VI, p. 237.] Compare the quotations from Bouillaud in the second note to p. 266, *supra*.

† See, for example, the descriptions of tenesmus in the passages cited in note ‡ to p. 336, *supra*, from the Hippocratic writings, and those of CELSUS, GALEN, &c.

‡ NICHOLAS PISO—*De cognoscendis et curandis præcipue internis humani corporis morbis lib. III*, Frankfort, 1580, Lib. III, Cap. 16, p. 279; FAB. HILDANUS—*De dys. lib.*, Cap. 12, p. 692 of Ed. cited on p. 337; FELIX PLATER—*Praxeos* Tom. III, Lib. II, Cap. 11. I cite the Basel Ed. of 1736, Tom. III, p. 796. SENNERTUS—*Pract. Med.*, Lib. III, Pars II, Sect. 2, Cap. 12, Tom. III, p. 196 of Ed. cited on p. 337.

important differences exist, which, if carefully observed during the progress of the disease, are sufficient to serve as the basis of diagnosis in the majority of cases.

Specimens collected at the Army Medical Museum, and autopsies recorded in Section III, show that the majority of the cases of acute dysentery which proved fatal during the late war belonged to the diphtheritic form. They also show that patients in the last stages of acute diphtheritic dysentery, emaciated and moribund, were often received from the field into the general hospitals, where, in the absence of any previous history except the imperfect and sometimes contradictory statements of the dying men, the diagnosis "chronic diarrhœa" or "chronic dysentery" was entered on the hospital register. These facts must be considered in interpreting the statistics of acute dysentery published in the First Medical Volume of this work. According to these statistics, as has been shown in the first section of this chapter,* the mortality of acute dysentery during the war was one death to every fifty-seven cases among the white troops, one to every seventeen among the colored troops; but these figures no doubt altogether understate the mortality of the disease, owing to the frequency with which the fatal cases were reported under the head of chronic diarrhœa or dysentery, in the manner just mentioned. This consideration must serve to correct the impression, which would otherwise be given by the statistics, that the acute dysentery of our armies during the late war was, especially among the white troops, a comparatively mild affection.† At the same time there is testimony from various sources that mild cases of dysentery were common enough, particularly during the early part of the war. Without going into details in this place, the reports for May and June, 1861, which give 994 cases of acute dysentery and but 3 deaths,‡ may be referred to, and attention may be directed to the fact that, although the source of error just pointed out can hardly have had a greater influence during the first year of the war than subsequently, the reports for the year ending June 30, 1862, represent but one death to every ninety-five cases of acute dysentery.§ The majority of these milder cases belonged, doubtless, to the simple inflammatory or catarrhal form, and it is on account of this circumstance that the lesions characteristic of this form of dysentery were observed in the autopsies made during the war so much less frequently than the diphtheritic lesions. The severer diphtheritic cases not merely constituted an exceedingly frequent and fatal variety of the camp dysentery of the civil war, but since the close of the war cases of this form of disease have occasionally been observed, during the course of local epidemics in the garrisons of the military posts, of which the epidemic that occurred in the detachment of troops stationed at Columbia, South Carolina, during the fall of 1868, and is described by Assistant Surgeon Elliott Coues, U. S. A., in the second section of this chapter,‖ affords an excellent example.

The division into two groups here employed is substantially the same as that into catarrhal and diphtheritic dysentery adopted by the best modern German writers on

* Page 5.

† In my "*Outlines of the Chief Camp Diseases of the United States Armies as observed during the present war*," Philadelphia, 1863, p. 223, I fell into this error, remarking: "Simple cases of ordinary acute dysentery have been common enough in the army. They have, however, as a general rule, been very mild. Of 32,237 cases reported prior to June 30, 1862, but 347 died. The malignant dysentery of European armies has not yet made its appearance among our troops." I am now satisfied that the diphtheritic form of acute dysentery, which will be described in this section, and which is essentially the same as the form which has at times decimated European armies, had made its appearance before I wrote, and that indeed a portion of the 638 deaths from chronic diarrhœa and dysentery reported during the same period were really due to this form of disease, which, however, certainly became still more frequent subsequently, and always produced a greater mortality among our troops than would be suspected from the sick reports alone. [The figures in the quotation from my book, which are the same as those subsequently given in *Circular No. 6*, p. 103, are slightly inaccurate, including the months of May and June, 1861, they should read 33,214 cases and 341 deaths. See Medical History, Vol. I, p. 636.]

‡ Medical History, Vol. I, p. 636. § *Supra*, p. 7. ‖ *Supra*, p. 62.

the disease, such as Virchow, Griesinger, Bamberger, Niemeyer and Heubner.* The credit of having first made this distinction has been assigned by Heubner to Virchow, but while acknowledging that great observer to have done good service, by the publication of two remarkable essays, towards bringing about the modern general acceptance of this view, his own contribution to it was merely the substitution of the term diphtheritic, as applied to the dysenteric inflammation, for such terms as "inflammation with the effusion of coagulable lymph," "pseudomembranous inflammation," and "croupous inflammation," which had previously been employed to describe the lesions of the intestinal mucous membrane observed after death from the graver form of dysentery. Indeed, Alexander of Tralles,† as early as the sixth century, under the title of *Dysenteria Rheumatica*, discriminated that form of dysentery in which various humors merely are discharged by stool, from the graver variety due to ulceration of the bowels, in which shreds of the intestine (pseudomembrane) are mixed with the discharges, and pointed out that the first variety, if protracted, might pass into the second. His descriptions are far from complete, especially from the anatomical point of view; yet the candid reader will not fail to be struck by their correspondence with the modern descriptions of catarrhal and diphtheritic dysentery. That this sagacious discrimination of the two chief forms of dysentery, which appears to have been based almost exclusively upon clinical considerations, and especially upon a study of the dejecta, did not attract the attention it deserved, is not surprising, when we consider that the study of pathological anatomy was not sufficiently advanced to furnish a sound anatomical basis for the distinction until the commencement of the present century.

The adjective rheumatic was not used by Alexander of Tralles in its modern sense, but as the equivalent of the term catarrhal, a use which is warranted by the derivation and history of the word. Cælius Aurelianus and Theodore Priscian‡ had previously spoken of dysentery as rheumatism of the intestines with ulceration, and still earlier Philumenus§ had called diarrhœa rheumatism of the bowels in the very same sense. By the Greek physicians the word *Rheuma* was used to signify a flux, and the derivatives *Rheumatikos* and *Rheumatismos* were employed, the first as an adjective, the second as a noun, to indi-

* R. VIRCHOW—*Zur Lehre der Unterleibsaffectionen*, V. Archiv, Bd. V, (1853,) S. 348; Idem, *Kriegstyphus und Ruhr*, Bd. LII, (1871,) S. 21. W. GRIESINGER—*Die Krankheiten von Egypten*, Abs. X, Cap. 2, Dysenterie. Archiv für Phys. Heilkunde, 1854, p. 529. H. BAMBERGER—S. 384, *op. cit.*, p. 266, *supra*. F. v. NIEMEYER—*Lehrbuch der Spec. Path. und Ther.*, 7te Aufl., Berlin, 1868, Bd. I, S. 621; Bd. II, S. 747 *et seq.* HEUBNER—*Dysenterie*, in Ziemssen's Handbuch der Spec. Path. und Ther., Bd. II, Theil I, Leipsic, 1874, S. 518. American Transl., New York, 1874, Vol. I, p. 537.

† ALEXANDER of TRALLES—*Libri duodecim*, Greek text with Latin transl. of J. Guinterius, Basel, 1556, Lib. VIII, Cap. 7, in edit. cited, pp. 423-431—treats of diarrhœa under the title of rheumatism of the intestines, (Περὶ ῥευματισμοῦ τῆς γαστρός.) The account professes to be borrowed from PHILUMENUS, and it is from this writer doubtless that the term used is derived. In Cap. 8 [pp. 432–454] he treats of rheumatic dysentery, (Περὶ δυσεντερίας ῥευματικῆς.) which he explains is excited by diarrhœa, (rheumatism of the intestines.) In Cap. 9 [pp. 454–472] he treats of the dysentery of the ancients, or that which arises from ulceration of the intestines. In rheumatic dysentery various acrid humors are discharged from the bowels, and, if the affection lasts long, it may result in ulceration of the bowels, which is true dysentery: "Quòd si hic affectus diutius perseveraverit, ad ulcerationem intestinorum perveniet, quæ propriò dysenteria dicitur," [p. 432.] This seems to be essentially the same idea which VIRCHOW has expressed in the words, "Dass eine katarrhalische Ruhr sich durch besondere Einwirkungen zur diphtheritischen Ruhr steigern könne."—*Kriegstyphus und Ruhr*, Virchow's Archiv, Bd. LII, S. 21. See also a similar passage in Archiv, Bd. V, S. 348. In the dysentery of the ancients the intestines are ulcerated, and the stools contain blood and scrapings of the intestines, (Ξύσματα;) the latter were undoubtedly our modern pseudomembranes and sloughs. Besides these two varieties of dysentery, our author in another place—Lib. VIII, Cap. 3 and 4, [pp. 400–413,]—describes hepatic dysentery, in which the stools resemble the washings of flesh, very much after the Galenical view. He has also a separate chapter on tenesmus, Cap. 6, [pp. 420–22,] and one on the cœliac flux, borrowed from PHILUMENUS, Cap. 5, [pp. 413–420.]

‡ THEODORE PRISCIAN—*Ad Timotheum*, Lib. II, Pars 2, Cap. 18, [in the Aldine *Med. Antiq.*, Venice, 1547, fol. 306.] This author, who wrote in the 4th century, says: "Est namque dysenteria intestinorum vulneratio, cum rheumatismo." CÆLIUS AURELIANUS, two centuries before, had written: "Est autem intestinorum rheumatismus cum ulceratione." [*Loc. cit., supra*, p. 337 ]

§ PHILUMENUS, according to MANGETUS—*Bibl. Script. Med.*, Geneva, 1731, Vol. II, Part I, p. 502—lived about the year 352 A. D., a date in regard to which some doubt may be entertained. None of his works are extant, but extracts from them are to be found in ALEXANDER of TRALLES, as for example those referred to above in note † *supra*, and a still larger number in the writings of ÆTIUS. Among the latter, note especially the chapter on diarrhœa—Tetrab. III, Serm. 1, Cap. 35, [*op. cit., supra*, p. 336,]—headed: "Quomodo alvum fluxione laborantem curare oporteat; ex libris Philumeni," which appears to be translated from the same source as Cap. 7, Lib. VIII of ALEXANDER of TRALLES. The Greek text of the last eight discourses of ÆTIUS has not been printed, and I have not obtained access to any Greek manuscript; but the chapter of ALEXANDER of TRALLES, just referred to, seems to leave no doubt that PHILUMENUS spoke of diarrhœa as rheumatism of the bowels. GALEN himself, who ordinarily used the word diarrhœa in the sense in which it is now employed, substituted for it the expression ῥεῦμα γαστρός in his *First Commentary on the Prognostics of Hippocrates*, § 8, [Ed. Kühn, XVIII, B, p. 33.] Note the remarks on the passage in question by GORRÆUS in his *Def. Med.*—Opera, Paris, 1622, p. 550.

cate the morbid condition from which the flux results.* The word Catarrh was substituted whenever the flux was believed to take place from the upper part of the body to the lower. The disease which we now know as rheumatism was described by them along with gout, under the designation Arthritis,† and is first spoken of as rheumatism in the seventeenth century, when we find the modern conception of that affection taking shape in the writings of Ballonius, C. Piso, Riverius, Chesneau and Sydenham,‡ who bestowed the term rheumatism upon it on account of its supposed fluxionary character. Since the general adoption of this-

* The Greek words used were ῥεῦμα and its equivalent ῥοος, or some inflection or compound of the verb ῥέω, to flow. For the doctrine of fluxes as taught in the Hippocratic writings,—see the treatise *De Locis in Homine*, [Ed. Littré, VI, p. 284.]—The morbid humor (*e. g.* phlegm) is formed in the head, and thence may be transported to any one of seven places, making seven fluxions, viz: to the nose, ears, eyes, chest, spinal marrow, vertebræ and flesh (producing dropsy) and the hip. In connection with the fifth variety, fluxes to the belly producing loose alvine discharges, are ascribed to the humor finding its way to the intestines through the œsophagus; the word here used to express such a flux is ῥεῦμα, p. 3[illegible]. In the treatise on *Affections*, [Ed. Littré, VI, p. 237,] it is explained that the flux producing diarrhœa, lientery or dysentery, comes from the head or chest; the word here used is catarrhus, (κατάῤῥοος.) Compare also the treatise *De Flatibus*, [Ed. Littré, VI, p. 105,] in which the doctrine of fluxes as is discussed at length, and flatus in the veins of the head declared to be the cause of the formation of the morbid humor; and the treatise on *Glands*, [Ed. Littré, VIII, p. 565,] in which the origin of the morbid humor in the brain, here compared to a gland, the doctrine of the seven fluxes and the flux to the abdomen are explained very much as in *De Locis in Homine*, cited above. The accord between the above passages, which occur in Hippocratic treatises of doubtful origin, derived probably from several distinct sources, would seem to indicate that the doctrine in question was widely accepted among the older Greek physicians. In all its essential points this doctrine was taught also by GALEN, but with him it formed only a portion of the general doctrine of fluxes which lies at the foundation of his pathology, and which, mainly on his authority, was generally accepted for more than fourteen centuries. According to GALEN, every part of the body is endowed by nature with four faculties: 1, the faculty of attracting its proper aliment; 2, of detaining this within it; 3, of altering and assimilating it; 4, of expelling the superfluous or excrementitious matter which results from the nutritive process.—*De Diff. Feb.*, Lib. II, Cap. 14, [Ed. Kühn, VII, p. 381;] *De Cur. Rat. per Venæ Sectionem*, Cap. 8, [Ed. Kühn, XI, p. 275.] These four faculties, which play a great part in the Galenical physiology, are discussed at length in the treatise *De Nat. Facult.*, [Ed. Kühn, II, pp. 1–214.] If now, in any morbid condition, the quantity of nutriment supplied to a part is greater than it is able to assimilate, the surplus may undergo various unhealthy changes, and the phlegm, or other excrementitious humor which results, and which would produce morbid alterations in the part itself if it remained in it, is very often driven from it by the expelling faculty, and finds its way to other parts through the bloodvessels or any of the pores and passages of the body. In this transfer of the morbid humor it finds its way usually from the upper parts of the body to the lower, or, in a more general way, from the stronger parts to the weaker, even without regard to position.—*De Diff. Feb.*, Lib. II, Cap. 14. Moreover, a flux may be called to a part by an abnormal increase of the attractive faculty of the part itself.—*De Diff. Feb.*, Lib. II, Cap. 15, [Ed. Kühn, VII, p. 384.] The formation of a morbid humor in the head and its descent thence to the nose, eyes, mouth, fauces, throat, or even to still lower parts, as the thorax, abdominal viscera, &c., is only one illustration of this morbid process, or one kind of flux, but a very important and frequent kind. Compare the account of this kind of flux in *De Sanitat. Tuenda*, [Ed. Kühn, VI, pp. 420–5.] In the Commentary on Aphorism III, 12, [Ed. Kühn, XVII, B, p. 586,] GALEN explicitly teaches that dysentery may be produced by the flux of phlegm from the head to the intestines, and the same doctrine is taught more or less clearly in various other places. But the flux may also take place from the liver, spleen or other parts, to adjacent or even to distant organs—*De Diff. Feb.*, (loc. cit.,)—or even from the interior parts of the body to the exterior, producing inflammations.—*Ad Glauconem de Medendi Methodo*, Lib. II, Cap. 2, [Ed. Kühn, XI, p. 78.] The morbid condition of debility or cachexia, which favors the development of such fluxes, is the rheumatic diathesis, [Ῥευματικὴ διάθεσις.]—*De Curandi Rat. per Venæ Sectionem*, Cap. 8, [Ed. Kühn, XI, p. 275.] See also the passage last cited above. The morbid humor, whose movement constitutes the flux, may consist either of phlegm or morbid bilious matter, (black or yellow bile,) in accordance with the causes by which it is produced. See, for example, *Com. IV, in Hippoc. de Acut. Morb. Victa*, § 27, [Ed. Kühn, XV, p. 790.] If the flux takes place from an upper part to a lower, it is called a catarrh, [κατάῤῥοος.] This term is especially applied to the flux which descends from the head to the mouth and air-passages,—*De Sympt. Causis*, Lib. III, Cap. 11, [Ed. Kühn, VII, p. 262,]—but it may also be bestowed upon the flux if it descends to the abdominal viscera.—*Com. in Hipp. Aph. III*, 12, cited above; also *Meth. Medendi*, Lib. VII, Cap. 11, [Ed. Kühn, X, p. 513.] For a concise abstract of the Galenical doctrine of catarrh and flux the reader may consult GORRÆUS, *Def. Med.*, Articles Ῥεῦμα, Ῥευματικὴ διάθεσις and Κατάῤῥοος.

† See, for example, the Hippocratic account of arthritis in *De Affect. Liber.* [Ed. Littré, VI, p. 213.] Acute rheumatism appears to be referred to as a variety of fever (ἄλλος τῦφος) in the treatise *De Intern. Affect.*, [Ed. Littré, VII, p. 207.] See also ARETÆUS—*De Causis et Signis Diut. Morb.*, Lib. II, Cap. 12, [Boerhaave's Ed., p. 65.]

‡ BALLONIUS, in his *Definitiones Medicæ*—[in Opera, Geneva, 1762, Tom. I, p. 265]—published after his death, (1616,) expounded, under the head of "Rheumatic diathesis," the humoral doctrine of flux as taught by HIPPOCRATES and GALEN, and referred at the end of the article to his own views as explained in his *Liber de Rheumatismo et Pleuritide Dorsali*, [op. cit., Tom. IV, p. 314 *et seq.*] In the part of the latter work which treats of rheumatism, he tells us that this affection has not been sufficiently explained by the ancients, and gives a very fair description of rheumatism in the modern sense, with pains in the muscles and tendinous parts as well as in the joints. See also the thesis appended to this treatise, entitled "An Rheumatismus et Arthritis Congeneres?" [*op. cit.*, Tom. IV, p. 331;] a question which he decides in the affirmative, giving the differential diagnosis in a manner which shows that he had under consideration the same diseases which we now call rheumatism and gout. Compare also his *Liber de Arthritide*, [op. cit., Tom. IV, p. 205.] CAR. PISO—*Morbi Externi Habitus à Diluvie Serosa, Obs. et Consil.* [Ed. Princeps, 1618; I quote from the Leyden Ed. of 1744]—treats of Arthritis in Sect. V, Cap. 1 and 2, and in Cap. 3 treats separately of pains affecting not only the joints, but also the muscles, periosteum, &c.; he does not, however, employ the term rheumatism. LAZARUS RIVERIUS—in *Prax. Med.*, Lib. XVI, Cap. 3, *De Rheumatismo*, [Opera, Lyons, 1679, p. 418.]—also distinguished rheumatism from gout (arthritis) by the circumstance that in rheumatism the muscles, periosteum, &c., are affected as well as the joints, while in gout the joints alone are involved. He remarks: "This is no new disease, yet it is not sufficiently described by the ancients," and "most physicians, who are ignorant of the nature of rheumatism, are wont to call it universal gout," (cum arthritidem universalem nominare soleant.) His description applies to chronic rheumatism rather than to acute, for he says: "Experience shows that in rheumatism, for the most part, there is no swelling, inflammation or change of color in the parts pained." Yet the acute form would seem to be indicated when he says: "If rheumatism begins with fever it is usually shorter, but torments the patient with more direful and cruel pains, and then gets well, or, at least, is much improved in from twenty to forty days." [*Op. cit.*, p. 420.] He relates in detail two cases of rheumatism—*Obs. Med. et Cur. Insig.*, Cent. III, Obs. 41, [*op. cit.*, p. 535.] and Cent. IV, Obs. 42, [*op. cit.*, p. 543.] NICOLAS CHESNEAU—*Observationum*, Libri V, Paris, 1672—has a chapter on rheumatism [Lib. IV, Cap. 12, p. 446] in which that disease is similarly explained. SYDENHAM, in his chapter on rheumatism—*Obs. Med.*, Sect. VI, Cap. 5, [Princeps Ed. 1676; I quote Opera, Geneva, 1736, Tom. I, p. 170. See also Translation of Sydenham Society, Vol. I, p. 251,]—gives the first complete description of acute rheumatism as now understood. A summary account of these changes in the use of the word rheumatism will be found in the article *Rheumatismus* in the *Medicinal Dictionary* of R. JAMES, London, 1745, Vol. III. See also the historical introduction to the curious work of EISENMANN—*Die Krankheits-Familie Rheuma*, Erlangen, 1841, Bd. I, S. 1–11—which is particularly valuable on account of its excellent bibliography, both on the subject of rheumatism in general and of the various disorders supposed to be of rheumatic origin, under which head EISENMANN includes, apparently with the utmost confidence, everything that any of his predecessors ever suspected to be of rheumatic nature.

use of the term, the old broader conception of its meaning has gradually become entirely obsolete, and at the present time the semi-obsolete word *rheum*, applied to thin discharges from the air-passages, or from certain skin diseases, appears to be its only survivor.

In the latter half of the last century, when the views of Alexander of Tralles with regard to this subject had long fallen into undeserved neglect, several writers,* among whom the most notable was Maximilian Stoll,† brought up anew the doctrine of the catarrhal nature of dysentery. Stoll brought again into use the old term rheumatism of the intestines, which he employed, as he himself explains, as the equivalent of "coryza ventris," and "intestinorum catarrhus;" but he had also adopted the new use of the word rheumatism proposed by Ballonius,‡ and this led him to assert a close relationship between the intestinal flux and the flux to the joints, which modern pathology cannot admit. Moreover, he fell into an error that Cælius Aurelianus and Alexander of Tralles had escaped. He asserted, led to this erroneous belief by the results of his own dissections, that ulceration of the intestine is an extremely rare complication in dysentery.§ The doctrine of Stoll found numerous partisans‖ at the time, and if of late it has seemed ridiculous to certain writers, this is only because the old signification of the word rheumatism has been forgotten.

*Among those who, before STOLL, insisted upon the catarrhal nature of dysentery, I may mention ANDREW WILSON—*An Essay on the Autumnal Dysentery*; London, 1761—who, though he did not use the epithet catarrhal, rejected all the popularly accepted causes of dysentery, such as the abuse of fruits or "venomous or infectious effluvia in the air," and attributed it to a suppression of the cutaneous perspiration due to exposure to cold: "The two surfaces of the lungs and intestines being to the surface of the skin, in a manner like two seconds to a principal, assisting and relieving it, in accommodating its perspiration to the seasons; whenever any sudden change gives a damp to the perspiration," the lungs or intestines suffer; the former for the most part in the spring, the latter in the autumn. MARK AKENSIDE—*De Dysenteria Commentarius*, London, 1764—known to the literary reader as the author of "The Pleasures of the Imagination,"—insisted upon the strict affinity of dysentery with rheumatism: "ejus est arctissima cum rheumatismo affinitas," (p. 21.) He explains that he gives the name of rheumatism "to those pains with which the joints, and the muscular and membranous parts of the body are affected, whether there is fever or not," and insists upon the fact that such pains sometimes occur during convalescence from dysentery, and sometimes during the progress of the disease, very much as STOLL subsequently did. With these views, he insisted on the use of diaphoretics, and especially of ipecacuanha, in the treatment, (p. 40.) BENJ. MOSELEY—*Obs. on the Dysentery of the West Indies*. London, 1781—in a tract dated Kingston, in Jamaica, July 15, 1780, (of which the copy cited is a reprint from the second Jamaica edition.) says: "That a flux is a *certain fever* of the intestines, and that this fever is caused by the *obstructed perspiration* being thrown there," (p. 5,) and therefore recommends sudorifics; "*a careful, continued course of them, to keep up a* SWEAT, *in extent proportioned to the violence of the disease*," (p. 10.) The same ideas were subsequently still further elaborated in *A Treatise on Tropical Diseases*, &c., 3d Ed., London, 1792, pp. 215 and 225.

†MAXIMILIAN STOLL—*De Natura et Indole Dysenteriæ Commentatio*, [Rat. Med., Pars III, Vienna, 1780, p. 245 *et seq.*]—asserted the cause of dysentery to be exposure to cold while in a state of perspiration. This cause produces in the winter inflammations of the upper parts of the body; of the middle parts in spring, and of the abdomen in summer and autumn. Of this reflux of the perspirable matters upon the intestines he says: "Hinc materies, quae alio anni tempore aut odontalgias fecerat, aut coryzas, anginas, catarrhos, &c., morbos videlicet serosos; nunc ad intestinorum membranas projecta *ventris coryzam*, aut *intestinorum catarrhum*, aut *eorundem rheumatismum* facit." [*Op. cit.*, p. 251.] In chaps. 2 and 3 he divides dysentery into—1, simple rheumatic; 2, rheumatico-bilious, or simply dysentery associated with excessive secretion of bile, allied to which are dysenteric bilious fever and dysenteric putrid fever, (synochus putris dysenterica,) and 3, inflammatory dysentery, *i. e.*, associated with inflammatory fever. This last variety he subdivides into benignant and malignant. In chap. 4 he offers a new subdivision of dysentery, drawn from its supposed relationship with the varieties of rheumatism. So strongly does this relationship impress him that he exclaims: "Hinc dysenteria non ob remotam quamdam analogiam, et per metaphoram, sed *verè* ac *genuinè rheumatismus intestinorum* dicetur, suntque hi duo morbi ἀδελφέα παθήματα, atque ejusdem matris." (p. 275.) The proposed subdivision is—1, simple benign, easily-curable dysentery; 2, chronic dysentery, comparable to chronic rheumatism of the limbs; 3, a grave and mortal variety, due to an inflammation of the intestines, which he compares to erysipelas, and 4, bilious dysentery. In this chapter he plainly shows that he uses the word rheumatism, in part at least, in the new sense, pointing out that sometimes rheumatism in the limbs suddenly disappears and dysentery supervenes, while, in other cases, the dysentery suddenly ceases and the wrists and knees swell and become painful, (p. 273.) Undoubtedly, therefore, STOLL had actually observed cases in which dysentery was complicated by rheumatism as we now understand it. STOLL studied dysentery during the summers of 1776–9, and gives in chap. II several autopsies, in two of which he describes the colon as inflamed and thickened, and mentions that its glands were tumefied, [pp. 315 and 346.] From these autopsies it was that he arrived at the conclusion that ulceration of the intestines is very rare in dysentery: "In cadaveribus dysentericorum nunquàm offendi suppuratam plagam, ut idcircò perrara existimem intestinorum ulcera ex dysenteria," [p. 323.] Of course the views of STOLL exclude the idea of contagion. He asserts that he never has seen it attack physicians or nurses attending to dysenteric patients, and that although the dejecta are offensive in odor, and invite putrid diseases, such as hospital fever, yet the notion that they produce dysentery in those who are exposed to them is not supported by observation. [*Op. cit.*, p. 327.]

‡Compare *Rat. Medendi*, Pars I, Ann. 1776, Mains, p. 77 *et seq.*, ed. cited in last note. §See note † *supra*.

‖Among others, I may mention D. OPPENHEIMER—*Diss. de Catarrho et Dysenteria*, Halle, 1783, which I have not seen; the author is said to take the ground that dysentery is a catarrh of the intestinal canal. See the abstract in S. J. L. DÖRING'S *Critisches Repertorium*, Herborn, 1803, S. 95. F. H. BERNSTEIL—*De Dysenteria Liber*, Manheim, 1786. A. G. RICHTER—*Med. und Chir. Bemerkungen*, Göttingen, 1793, [there is also an English translation, Edinburgh, 1791,]—says that dysentery is "a rheumatic or catarrhous affection of the intestines, particularly of the great guts, and that the proper remedies for the disease are sedatives and diaphoretics," (S. 85.) He thinks that there may be "a specific catarrhous miasma," and remarks: "The influenza has given strong proofs of this," (S. 107.) HUFELAND—*Bemerkungen über die im Herbst, 1795, in und bey Jena ausgebrochene Ruhrepidemie, und den ausgezeichneten Nutzen der Nux Vomica in derselben*, Hufeland's Journal, Bd. I, [1795,] S. 76 *et seq*—expressed the opinion that dysentery is a mere local disease of the large intestine, as gonorrhœa is of the urethra and catarrh of the bronchial mucous membrane, and that indeed it has the greatest analogy with these diseases, (S. 90.) He found the cause in suppressed perspiration, and specially brings forward the influence of cold nights after hot days on individuals previously exposed to the continuous heat of summer, (S. 94.) He uses STOLL'S designation "simple or rheumatic dysentery," (S. 96 and 129) to describe the class of cases most commonly observed by him. Inflammatory complications were not frequent in the epidemic, but putrid complications were more common. In connection with the inflammatory complications, he mentions a post mortem examination in an old man in whom the glands of the large

Nevertheless, he must be admitted to have given undue prominence to the catarrhal form of dysentery to the exclusion of a due consideration of the graver variety, in which pseudomembranous deposits and ulceration play a prominent part. He presented this one-sided view with great ingenuity, but even his genius would hardly have secured for it the favor it enjoyed, had post mortem examinations been common among his contemporaries.

A broader view was taken at the commencement of the present century by J. P. Frank, who not only anticipated O'Brien, to whom Heubner* has erroneously given the credit of being the first "to bring up the idea of pseudomembranous inflammation of the intestine," but also anticipated Virchow, if not in the application of the word "diphtheritic" to the dysenteric process, at least in an appreciation of the anatomical facts by which this use of the term diphtheritic is justified, so far as they can be observed without the aid of the microscope. Frank asserted† that mere suppression of perspiration produces diarrhœa rather than dysentery; that dysentery consists essentially in an inflammation of the colon and rectum, which may be of various characters, sometimes superficial, sometimes deep; that these diverse inflammations of the lower end of the alimentary canal are strictly comparable to the inflammations of the throat (that is, of the upper end of the alimentary canal) and are produced by similar causes; and that grave dysentery, especially malignant dysentery, is characterized by a condition of the intestinal mucous membrane which exactly resembles the state of the mucous membrane of the throat observed in membranous and ulcerous cynanche,—that is, as his description‡ shows, the disease which we now call diph-

intestine were enlarged to the size of small peas and numerously sprinkled over the surface. The patient died of dysentery after long suffering from chronic diarrhœa, (S. 104.) C. G. SELLE—*Med. Clinica*, Wien, 1797: "The cause of this disease (dysentery) is a special epidemic miasma which causes a sort of catarrh in the intestines," (p. 139.) "It is also frequently observed that rheumatisms and pains in the teeth precede, which disappear as soon as the dysentery sets in," (p. 140.) C. F. HARGENS—*Ueber die epidemische Constitution zu Kiel, besonders die dortige Ruhrepidemie im Jahr* 1798, Hufeland's Journal, Bd. VII, [1799.] St. 2, S. 87; St. 3, S. 130—also speaks of dysentery of the "simple rheumatic character," [St. 2, S. 106.] He states that rheumatic pains were frequent toward the end of the disease, especially in the hip-joints and the lower extremities, sometimes also between the shoulder blades; often these pains alternated with the dysenteric symptoms. [St. 3, S. 141.] J. H. G. SCHLEGEL—*Epidemische Constitution von Ilmenau; nebst einer allgemeinen Uebersicht von Michaelis*, 1796, *bis Michaelis*, 1798, *daselbst beobachteter Krankheiten*, Hufeland's Journal, Bd. IX [1800.] St. 1, S. 84—says, in the same spirit, of the dysentery which was epidemic at Ilmenau in November and December, 1797: "Mir schien diese Ruhr rheumatischen Ursprungs zu seyn. Ansteckend war sie nicht," [S. 105.] According to F. LESSER—*Die Entzündung und Verschwärung der Schleimhaut des Verdauungskanales*, &c., Berlin, 1820, S. 278—the doctrine of STOLL was embraced also by PAULITZKY—*Med. Prakt. Beobacht.*, Frankfort, 1784, 2te Sammlung, S. 55; VAN GEUNS—*U. d. epidem. Ruhr besonders des Jahrs*, 1783, Dusseldorf, 1790; VOGLER—*Von der Ruhr und ihrer Heilart*, Giessen, 1797, and VOGEL—*Handbuch der prakt. Arzneiwiss.*, Thl. VI, S. 132. LESSER [*loc. cit.*] makes the same statement with regard to J. P. FRANK; but in this case he does not appear to be at all accurate. FRANK—*De Curandis Hominum Morbis Epitome*, Lib. V, Pars II, § 687–693, [Lib. V, Pars II, of this work was first published, Manheim, 1807; I quote from the Milan Ed. of 1832, Vol. III, p. 436]—makes the fluxes his 5th class of diseases, and divides them into—1, serous fluxes; 2, mucous fluxes, (including catarrh of the air-passages, blenorrhagia, &c.;) 3, sanguine fluxes; and 4, mixed fluxes, describing diarrhœa and dysentery under this last head. Suppressed perspiration he thinks causes *diarrhœa*—not dysentery—and although rheumatismal symptoms are sometimes observed in the course of dysentery and seem to arrest the flux, yet this is not because the two diseases depend on the same cause, but because a new disease, though it may depend on a different cause, often imposes its law on its predecessor. [*Op. cit.*, p. 443.] FRANK originated a conception of the dysenteric affection, based upon anatomical observation, which is very similar to the modern opinions. See note ‡ *infra*. Among the latest of the writers who have given prominence to the conception of rheumatic dysentery, as taught by STOLL, I may mention EISENMANN—*Die Krankheits-Familie Rheuma*, Bd. III, Erlangen, 1842, S. 353—who describes, under the designation *Mykо-Rheuma Coli*, the dysenterica rheumatica of his predecessors.

* HEUBNER, p. 592 of work cited p. 340, *supra*, p. 521 of American transl. O'BRIEN's book, to which reference is made, is his *Observations on the Acute and Chronic Dysentery of Ireland*, Dublin, 1822, which I have not been able to see.

† J. P. FRANK—*De Curandis Hominum Morbis Epitome*, Lib. V, Part 2. [Edit. cited above, Vol. III, p. 436 *et seq.*] Note particularly his discussion of the causes of dysentery, § 691.

‡ The passage in which these views are expressed [Ed. cited, Vol. III, p. 444] is so noteworthy that I offer the following translation of it: "The disease which attacks the throat, that is, the entrance to the intestines through the fauces, is not different from that which attacks the anus or rectum, that is, the exit of the intestines, and the greatest affinity exists between the many kinds of cynanche and dysentery. In the more severe forms of angina there occurs a sensation of heat, with redness, swelling, tension, a secretion of a humor sometimes purulent, sometimes sanious, continual hawking a perpetual attempt at swallowing, accompanied by pain, and in all things very similar to the tenesmus about the anus in dysenteric patients. Membranous and ulcerous cynanches agree in almost all things with severe dysentery, but most especially with malignant dysentery, and just as ash-colored spots, dark and livid, gangrenous and fetid, are often seen to occupy the fauces, œsophagus or larynx in the former, so, likewise, these same things are often seen to occupy the rectum or the colon in those whom dysentery has destroyed. Wherefore, as in the latter disease, caruncolæ, pseudomembranes and polyp like concretions frequently pass out through the anus: in membranous cynanche they are expelled by coughing." I add a transcript of the Latin original of this remarkable passage: "Non alius est, qui guttur, seu *intestinorum* per fauces *introitus*, —quam qui anum rectumve intestinum, seu *intestinorum exitum*, occupet morbus; ac summa plures *cynanchis* species inter atque *dysenteriam* affinitas intercedit. In angina fortiori, sensus ardoris, rubor, inflatio, tensio, puriformis, interdum subcruenti humoris secretio, sereatio continua, deglutiendi usus perpetuus, dolore plenus, ac *tenesmo*, quo ad anum est dysentericis, in omnibus persimilis, occurrunt. *Cynanches membranacea, ulcerosa*, cum *dysenteria gravi*, sed potissime cum *maligna*, vix non in omnibus consipirant; ac sicut maculae cinereae, ex livido nigrescentes, gangraenosae lotidaeque illine fauces, oesophagum, laryngem —ita rectum, vel et colon intestinum, in illis, quos *dysenteria* enecuit, frequenter occupare cernuntur. Quae hoc in morbo caruncolae, pseudomembranae concretiones polyposae per anum haud raro secedunt; illae in *cynanche membranacea* per tussin expelluntur."

theria. He not merely spoke of pseudomembranes as being passed per anum in dysentery, but described an autopsy in which he found portions of the transverse and descending colon and rectum coated with pseudomembrane.*

Among the medical writers by whom about this period attention was directed, under one name or another, to pseudomembranous inflammation of the intestine in dysentery, I may also particularly mention Alexander Monro, jr.,† who, using the phraseology which had become current in England under the influence of the teachings of John Hunter,‡ asserted that the effusion of coagulable lymph was a common result in severe inflammation of the intestinal mucous membrane, and made use of this fact to explain the descriptions of post mortem appearances in dysenteric subjects which had previously been published by Baker, Pringle and Donald Monro.

The comparison which Frank had instituted between pseudomembranous inflammation of the intestinal canal and membranous angina, was subsequently adopted by Hildenbrand,§ and, while the subsequent progress of pathological anatomy drew attention in all quarters to pseudomembranous formations in dysentery,‖ it would appear that the analogy pointed out by Frank was never lost sight of in Germany, where the term croupous

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* For Frank's description of the pseudomembranes passed in dysentery, see *op. cit.*, Vol. III, p. 439, where he says that very frequently, in all the varieties of dysentery, "a puriform matter, morbidly secreted from the internal surface of the rectum solidifies, and having been converted into pseudomembranes is expelled through the anus in various forms," among which he describes delicate flocculent shreds, carunculæ, long pellicles and polypus-like tubes. That he knew the pseudomembranous formation was not limited to the rectum is shown by his account of the autopsy in the case referred to in the text. "In recto intestino non minus, ac colo sinistro atque transverso inflammationis comparebant vestigia, atque *vera* hinc inde *exulceratio*. Alibi, dictorum canalium superficies interna a pseudomembrana atque variis excrescentiis erat obducta;" [*op. cit.*, Vol. III, p. 445,] which may be translated: "In the rectum, not less than in the descending and transverse colon, traces of inflammation appeared, and here and there true ulceration. In other places, the internal surface of the canals mentioned was coated by pseudomembrane and various excrescences." This description is evidently drawn from nature and by a skilled observer.

† Alexander Monro, Jr.—*The Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, Edinburgh, 1811, p. 119.

‡ Hunter himself, while pointing out that inflamed mucous membranes usually discharge pus, remarks that if this inflammation "becomes more violent, or has something of the erysipelatous disposition, we find that it moves from the suppurative to the adhesive, and throws out the coagulating lymph." He goes on to say that he has observed this on the inside of the intestines in strangulated hernia, &c.,—[*Treatise on the Blood, Inflammation, and Gun-Shot Wounds*, Part II. Chap. II, § 4, London, 1794, p. 242,]—but he does not connect it with dysentery. The exudation of coagulable lymph on the intestinal mucous surface was also described by C. R. Pemberton—*A Practical Treatise on Various Diseases of the Abdominal Viscera*, 2d Edit., London, 1807—who remarks, in Chap. 10, on *Inflammation of the Mucous Membrane of the Intestines:* "This inflammation generally terminates by a throwing out of coagulable lymph, which may be discovered in the evacuations, resembling shreds of boiled macaroni," (p. 188.) I have not referred to this writer in the text, because he did not connect this condition with dysentery. (See his account of dysentery, in Chap. 8.) He furthermore did not very justly appreciate the significance of pseudomembranous inflammation of the intestinal mucous membrane, for he remarks: "When we observe these shreds in the evacuations, we may safely pronounce that the patient will soon recover," (p. 188.)

§ Val. Nob. Ab Hildenbrand—*Institut. Pract. Med.*, Tom. III, p. 326 *et seq.*, Vienna, 1822—in his description of enteritis, says that it may terminate in resolution, gangrene, suppuration, or in the various species of what he calls hypoclepsis, (*i. e.*, morbid transudation, from ὑπό, under, and κλέπτω, to steal.) Of this morbid process he describes two kinds, viz, b. lymphatico-plastica, and b. serosa. (See Vol. II, p. 277.) Among the varieties of hypoclepsis, he mentions that "plastic lymph" may coagulate into pseudomembranes on the mucous surface of the alimentary canal, and may be passed by stool, sometimes even in the form of casts of the intestinal tube, an affection which is strongly analogous to membranous angina, "adfectus anginæ membranaceæ summe analogus," [Vol. III, p. 326.] In a subsequent part of the same work, under the heading Phlegmhymenitis et Febris Catarrhosa, he explains that the term catarrh should belong to the inflammations of all mucous membranes, and censures those who restrict it to the air-passages, (p. 460.) He describes "enteritis catarrhosa," catarrhus intestinalis, as producing dysenteria catarrhosa or diarrhœa catarrhosa, according to its seat and the presence or absence of tenesmus. In this disease it frequently happens that filaments and coagula of lymph, or evident pseudomembranes mixed with shreds of the intestinal tunics, are found in the stools, (p. 475.)

‖ Thus Andral taught in his lectures—*Cours de Path. Interne*, Rec. et réd. par A. Latour, Paris, 1836, Tome I, p. 92—that sometimes in dysentery the mucous membrane of the colon is lined by false membranes—"Quelquefois tapissée par de fausses membranes." Consult also Id., *Précis d'Anat. Path.*, Brussels, Tome I, 1837, p. 413. Gély—*Essai sur les Altérations Anatomiques qui constituent spécialement l'état dysenterique*, Journ. de la sect. de Méd. de la Soc. Acad. du département de la Loire-inférieure, T. 14, 1838, p. 193—described "la production d'une pellicule pseudo-membraneuse" (p. 217) among the lesions which he observed in an epidemic of dysentery in the valley of the Loire. J. Cruveilhier—*Anat. Path. du Corps Humain*, Tome II, Paris, 1835-42—gives an excellent colored plate—Livr. 38, Pl. 3, fig. 2—of the lower extremity of the colon of an individual who died with all the symptoms of acute dysentery, and in whom the mucous surface was completely coated with pseudomembrane—"une pseudo-membrane blanche, morcelée, très adhérente." He also gives another plate representing the lower part of the ileum and the greater portion of the colon of a dysenteric subject—Livr. 40, Pl. 5—which is evidently affected by pseudomembranous inflammation, although he does not make use of that term. His description reads: "The internal surface of the large intestine presented a gangrenous appearance, and, in fact, was a true gangrene; the mucous membrane was transformed into a blackish, thick, adherent, gangrenous layer; you would have said its destruction was the result of the action of sulphuric acid." The text of Livr. 40, accompanying this plate, contains a general discussion of the pathological anatomy of dysentery, which the author regards, not as an inflammation of the follicles, but as a general erythematous, or erysipelatous inflammation of the mucous membrane. Meanwhile, in Germany, we find the comprehension of the subject gradually assuming its modern form. In illustration, I may refer to C. G. Neumann—*Von den Krankheiten des Menschen*, Spec. Theil. Bd. I. Berlin, 1836, S. 289 *et seq.*—who divided fully-developed dysentery into: 1, simple, or as it may be called catarrhal, that is, rheumatic; 2, inflammatory. The latter may terminate in gangrene or in various metamorphoses of the intestinal coats, sometimes in the formation of pseudomembranes—"Es erzeugen sich zuweilen falsche Membranen," (p. 291.) Neumann, however, objected to the use of the word catarrhal—"Dysentery is never strictly catarrhal, for its seat is not the mucous coat of the colon, but its nervous coat," (*i. e.*, its submucosa.) "A disease of the mucous membrane alone produces diarrhœa," (p. 289.)

inflammation, made classical by the work of Rokitansky,* was applied to the dysenteric process by various authors, among whom Finger† may be mentioned as having published, in 1849, an excellent account of dysentery as observed at the Hospital of Prague, in which he separated the disease there observed into two varieties, one due to intestinal catarrh, and the other to croupous inflammation of the intestinal mucous membrane, and gave descriptions of these varieties which closely correspond with the modern views.

This subdivision of dysentery into a catarrhal and a diphtheritic variety is not without a certain degree of correspondence with some of the subdivisions adopted by the older medical writers from clinical considerations. Thus, of the three grades indicated by Galen,‡ and insisted upon by medical writers of the sixteenth and seventeenth centuries, such as Fernelius, Forestus, Hildanus, Sennertus, Rolfincius and Ettmüller,§ the first, in which the dejecta consist of mucous, whitish, viscid matters, supposed by the ancients to be fatty, with or without blood, corresponds to our catarrhal dysentery; while the second, in which shreds and pellicles are mixed with the stools, and the third, in which thicker membranes, supposed to consist of the coats of the intestines themselves, make their appearance, correspond to diphtheritic dysentery of more or less severity. The former, Sennertus, following the teachings of Galen, called "dysenteria fiens," the latter, "dysenteria facta;"‖ expressions which may be regarded as almost synonymous with catarrhal and diphtheritic dysentery.

A similar correspondence, though perhaps not quite so clear, may be noted between the subdivision adopted in this chapter and that into benignant and malignant dysentery (d. benigna et d. maligna) which is indicated by Amatus, Forestus, Schenckius, Sennertus

* CARL ROKITANSKY—*Handbuch der Path. Anat.*, Wien, 1841-46. I cite the transl. of the Sydenham Society, London, 1849-54, Vol. I, p. 134 *et seq.* This author, however, only admitted croupous exudation upon "the mucous membrane of the intestines, and of the colon in particular, as representing one form of dysentery," (p. 136;) and although he regarded the dysenteric process as allied to the croupy form of inflammation of the intestinal mucous membrane, (Vol. II, p. 63,) yet he treats of it as a special affection, analogous rather "to the corrosion of the mucous membrane produced by a caustic acid," (p. 88.) See also his article—*Der dysenterische Prozess*, etc.—Œsterreich. Jahrb., N. F. Bd. XX, (1839,) p. 81 *et seq.*—in which this idea is fully elaborated, and the suggestion made that the lesions of dysentery are caused by an abnormal acidity of the blood, developed in the affected mucous membrane, or some other *atrium morbi*, (p. 17.) The account of dysentery in the first edition of his Pathological Anatomy is condensed from this article. In the last edition of this great work—*Lehrbuch der Path. Anat.*, Bd. III, Wien, 1861, S. 207 *et seq.*—Rokitansky has somewhat modified his views, for he describes dysentery in connection with "diphtheritic inflammation" of the intestine, and speaks of "diphtheritische Dysenterie," (p. 206,) though he still dwells on the comparison of the process with the effects produced by caustic substances, and especially by caustic acids, (p. 210.)

† FINGER—*Die während den Jahren 1846-48, in Proger k. k., allg. Krankenhause beobachteten Epidemien. III. Die epidemische Ruhr*, Prager Vierteljahrsebrift, Bd. XXIV, (1849, Ed. IV,) S. 125. "The local lesion was manifested in two forms: A, as *intestinal catarrh*, in which the intestinal follicles principally were involved, (follicular inflammation or ulceration;) B, as dysentery (Ruhr) or *croupous inflammation of the intestinal mucous membrane*. Nevertheless, both these forms of the local affection appear to us to be merely different stages of development of one and the same disease, or as the expression of the same blood-crasis from which the inclination to inflammatory affections of the intestinal mucous membrane and its glands results." The epidemic described by FINGER was also observed by BAMBERGER—[S. 381 *et seq.*, *op. cit.*, p. 266, *supra*]—and served as the basis of his well known description.

‡ See especially *Comm. in Hippoc. Aph.* IV, 26, [Ed. Kühn, XVII, B, p. 691,] and *De Loc. Affect.*, Lib. VI, Cap. 2, [Ed. Kühn, VIII, p. 382.]

§ The description of FERNELIUS—*Pathologia*, Lib. VI, Cap. 10, [p. 187, Edit. cited on p. 337,]—is so succinct that I offer a translation: "At first indeed, the mucus of the intestines (intestinorum mucus) is discharged, next the fatty matter which adheres to them on the inside is voided with a small quantity of blood; and this is the first species of dysentery. The second is when the internal tunic of the intestines is scraped, and pellicles and fibres of it appear mixed in with the stools. The third, when the ulceration penetrating and eating in more deeply, the flesh itself and proper substance of the intestine drops out putrid or corrupted." Compare P. FORESTUS—*Obs. et Cur. Med.*, Lib. XXII, Leyden, 159[illegible], Obs. 31, Schedia, p. 346, and FABRICIUS HILDANUS—*De Dysenteria*, (1602,) Cap. 2, [in Opera, Frankfort, 1646, p. 608,]—the latter writer teaches that the first two stages are curable, but that the last is the condition described by HIPPOCRATES in Aph. IV, 26, as mortal. In this he follows the commentary of GALEN quoted in the previous note. SENNERTUS—*Pract. Med.*, Lib. III, Pars 2, Sect. 2, Cap. 7, [in Opera, Paris, 1641, Tom. III, p. 127;] ROLFINCIUS—*Epitome Meth. Cognoscendi et Curandi*, etc., Lib. III, Cap. 17, Jena, 1655, p. 292, and MICHAEL ETTMÜLLER—*Colleg. Pract. de Morb. Humani Corporis in genere*, Pars I, Cap. 9, [in Opera, Lyons, 1690, p. 126,]—also describe these three grades.

‖ SENNERTUS says, [passage cited in note § *supra*:] "Illam Galenus γιγνομένην, Fientem dysenteriam, hanc γεγονυῖαν & κατασκευασθεῖσαν, Factam et consummatam nominat." In the margin, by a misprint in the edition cited, the reading "Dysenteria Fient & Facta" occurs. In the Wittenberg editions of the Pract. Med. of 1648 and 1656, Lib. III, p. 334, the marginal reading is "Dysenteria Fiens & Facta." The passage of GALEN to which SENNERTUS refers is contained in his Commentary on Aph. IV, 26, (see note ‡ *supra*,) and, after describing the three stages, says of the last: "Καὶ ὅταν ἤδη χρόνον οὐκέτι γίνεσθαι τὴν δυσεντερίαν, ἀλλ' ἤδη γεγονέναι καὶ κατεσκευάσθαι φαμέν. At which time we do not say that dysentery is still developing, but that it is already developed and fully formed." According to this passage, "Dysenteria Facta" would correspond only to the third grade described in the text, and "Dysenteria Fiens" would include the first and second, that is, catarrhal dysentery and the milder cases of diphtheritic. It may be added that the present participle Fiens, which does not occur in classical Latin, is given in the Lexicon of FACCIOLATUS and FORCELLINUS, [London, 1828, Vol. I, p. 779,] on the authority of *Diomedes*, Lib. I, pp. 352 and 377. I may add that ZACUTUS—*Praxis Hist. L. b. Ult.*, [1642, in Opera, Lyons, 1649, Tom. II, p. 631,]—who also describes the three grades after GALEN, applies the term factam to the last grade only, and does not use the participle fiens, but says: "Quo tempore dysenteriam dicimus factam, et constructam, non verò in fieri, ut 4, Aph. 26 dictavit Galenus."

and Willis,* and more formally expressed by Ettmüller, Dolæus and Hoffmann.† The same remark applies to the subdivision into sporadic and epidemic dysentery, formulated in the writings of Sennertus, Ballonius and Ettmüller,‡ and recently insisted upon by Jaccoud and Barrallier;§ to the subdivision, into sthenic and asthenic, adopted by J. P. Frank,‖ and that into "dysenterie légère" and "intense," employed by Chomel and Blache and other modern French writers.¶

But no correspondence exists between the subdivision into catarrhal and diphtheritic dysentery and that into red and white dysentery, which is based solely upon the presence or absence of blood in the dejecta. According to Sprengel,** this distinction was first made by Nonus, in the tenth century; but the chapters he refers to in proof of this assertion †† merely contain an abstract of the teachings of Galen‡‡ with regard to the differences between dysentery properly so called and various other bloody discharges from the bowels, which some of his predecessors, in his opinion erroneously, had embraced under the designation dysentery. If these chapters are to be regarded as making the distinction in question, it dates back to Galen, and, indeed, even to the epoch of the Hippocratic writings;§§ but it

*See AMATUS—*Curat. Med.*, Cent. III, 90, [Venice Ed., 1557, p. 488,]—the heading is: "Curatio nonagesima, in qua agitur, de dysenteria contagiosa, et pestilenti." Compare P. FORESTUS—*Obs. et Cur. Med.*, Lib. XXII, Leyden, 1596, p. 393,—headed: "Obs. 38. De dysenteria quadam contagiosa et pestilenti." J. SCHENCKIUS—*Obs. Med. Rar.*, (1584-97,) Frankfort, 1609, Lib. VI, *De Variis Pestilentibus Defluxionibus*, Obs. VI, p. 861, *Dysenteria Epidemica Maligna*—describes an epidemic of dysentery which, in the year 1583, prevailed from the latter part of summer till the end of the autumn, and which he says was "satis maligna, longe lateque grassans." He briefly describes also the epidemic chronicled by Gregory of Tours. SENNERTUS—*Pract. Med.*, Lib. VI, Pars 2, Cap. 5, [in Opera, Paris, 1641, Tom. III, p. 997,]—speaks of the epidemic dysentery of the years 1513 and 1624 as "dysenteria maligna," remarking: "Et solent istæ dysenteriæ sæpe adeo malignæ esse, ut paulò post in pestem degenerent." WILLIS says—*De Med. Operat. in Corpore Humano*, Sect. III, Cap. 3, p. 80, [in Opera, Geneva, 1680,]—that the ordinary London dysentery was not very malignant, ("non admodum maligna,") but that at other times it is virulent, and, as it were, pestilential. The marginal reading is: "Affectus hic aut mitior aut maligniis est."

†MICHAEL ETTMÜLLER—*Colleg. Pract. de Morbis Humani Corporis in Genere*, Pars I, Cap. 9, [in Opera, Lyons, 1690, p. 125.]—says: "Alia sit benigna, alia maligna;" that the first is, for the most part, without fever, and occurs sporadically; that the second is accompanied very generally by malignant fever, and is often epidemic and contagious. DOLÆUS—*Encyc. Med. Dogm.*, Lib. III, Cap. 5, [in Opera, Frankfort, 1703, p. 234,]—"Dysenteria est vel benigna, vel maligna." HOFFMANN—*Med. Rat. Syst.*, Tom. IV, Pars III, Sect. II, Cap. 7, [in Opera, Geneva, 1740, Tom. III, p. 152.]—"Ipsa vero dysenteria dividitur in benignam atque malignam." F. L. I. VALLEIX—*Guide du Médecin Praticien*, 5me Édit., Tome IV, Paris, 1866, p. 34—divides dysentery into *non fébrile*, which he says has been described as benignant, and is always sporadic, and *fébrile*, which has been called malignant, grave, &c., and is almost exclusively epidemic.

‡SENNERTUS remarks—*Pract. Med.*, Lib. III, Pars 2, Sect. 2, Cap. 7, [in Opera, Paris, 1641, T. III, p. 127.]—"Sunt et aliæ dysenteriæ differentiæ, quod nunc est epidemia, nunc ex morborum σποράδων numero." BALLONIUS—*Consil. Med.*, Lib. II, (1636,) Cons. 23, [in Opera, Geneva, 1762, Tom. III, p. 214.]—says: "At dysenteriarum aliæ sunt populares, aliæ non." See also ETTMÜLLER, *loc. cit.* in note † *supra*.

§S. JACCOUD—*Traité de Path. Interne*, 2me Édit., Paris, 1872, Tome II, p. 327—makes three varieties: d. sporadique, d. endémique, and d. épidémique. The same subdivisions are adopted by A. BARRALLIER—Art. *Dysentérie* in Nouv. Dict. de Méd. et de Chir. Pratiques, Tom. XI, Paris, 1869, p. 729.

‖Dysenteria sthenica et d. asthenica. See J. P. FRANK, *De Cur. Hom. Morb. Epitome*, Lib. V, Pars 2, § 690, [Milan Ed., 1832, Tom. III, pp. 437 and 440.] This distinction is adopted by COPLAND—Art. *Dysentery* in Dict. of Pract. Med., London, 1858, Vol. I, p. 693 *et seq.*—as his principal subdivisions of acute dysentery.

¶CHOMEL *et* BLACHE—Art. *Dysentérie* in Dict. de Méd., 2me Édit., Tom. X, Paris, 1835, pp. 556 and 558. So also the *Myxo-Rhruma Coli* of EISENMANN—see note to p. 343, *supra*—corresponds to catarrhal dysentery, while his *Colo-Typhus*—see note to p. 336, *supra*—corresponds to the diphtheritic form.

**KURT SPRENGEL—*Geschichte der Arzneykunde*, 3te Aufl., Bd. II, Halle, 1823, S. 316.

††THEOPHANES NONUS—*Epit. de Cur. Morborum*, Greek and Latin, Bernard's Ed., Gotha and Amsterdam, 1794-5, Cap. 167 and 168, Tom. II, p. 34 *et seq.*, or in the Strasburg Ed. of 1568, pp. 188-191. The passages referred to may be translated thus from the Greek text: Cap. 167. "On Dysentery. An ulceration of the intestines is called dysentery. This is caused sometimes by the transmutation of a tenesmus, sometimes by bilious and acrid secretions. The symptom is the discharge of bloody matters and scrapings, (ξύσματα,) and this occurs when the putrid membranes of the intestines are discharged, (ὑμένας ἐκ τῶν ἐντέρων σηπωμένας καταφέρεσθαι.)" * * * Cap. 168. "On bloody Dysentery. (Περὶ αἱματηρὰς δυσεντερίας.) Dysentery is called bloody, whenever blood is discharged either pure, or resembling the washings of flesh recently killed, or feculent (τρυγώδες) or black." * * *

‡‡Compare, for example, GALEN, *III Comm. in Hippoc. Epidem.* III, § 70, [Kühn's Ed., XVII, A, p. 725.] where, speaking of bloody dysentery, (δυσεντερίαις ταις αἱματηραίς,) he remarks: "We have learned that these are two-fold; that the first variety results when the intestines are eroded by ulceration, the second when there is an abundance of blood discharged through the veins pertaining to the intestines." The same view is expressed in more detail in *De Sympt. Causis*, Lib. III, Cap. 7, as explained in note ‡ to p. 336, *supra*, where he subdivides the bloody discharges from the bowels which are not properly dysenteric into three varieties, and distinguishes them from dysentery properly so called. The same distinctions are taught in *Comm. IV in Hippoc. de Articulis*, § 38 and 39, [Ed. Kühn, XVIII, A, 721-731,] and various other passages.

§§Thus the term red dysentery [δυσεντερ.η ἐρυθρή] is applied to bloody stools in HIPPOCRATES, *Epidem.*, Lib. II, near the end of Sect. 3, [Ed. Littré, Vol. V, p. 121,] in a paragraph which is substantially the same as *Aph.* V, 65, [Ed. Littré, Vol. IV, p. 559.] The Commentaries of GALEN on these two passages are particularly instructive. [For the first, see Ed. Kühn, Tom. XVII, A, p. 459; for the second, Tom. XVII, B, p. 877.] See also, besides the Hippocratic passages referred to in the last note, a passage in the *Prænotions of Cos*, in which bloody dysentery (αἱματώδης) is contrasted with bilious dysentery, (χολώδης,) [Ed. Littré, V, p. 687.] This distinction between dysentery from ulceration and bloody dysentery is also made by PAULUS ÆGINETA—Lib. III, Cap. 42, [Transl. of Syd. Soc., London, 1844, Vol. I, p. 525.]—who uses the very same adjective to express the bloody variety that NONUS employs. [Compare the Basel Greek Ed. of 1538, p. 97.] It is repeated by THEOPHILUS [in the 7th century]—*De Retrimentis Alvi*, Cap. XI, [bound with his *Lib. de Urinis*, Greek and Latin, Leyden, 1703, p. 260.]—who, after explaining that bloody stools may result not only from ulceration of the intestines, but also from disease of the liver or rupture of bloodvessels, adds that the latter accident occurs quite frequently, and that such fluxes of blood are called by the vulgar "Asclepiasmus," (Ἀσκληπιασμός.)

must be observed that Nonus could not have had this distinction in view, since he mentions blood as an ingredient in the stools of both dysentery proper and bloody dysentery; in the first the blood is mingled with the scrapings of the intestines which are discharged by stool; in the second the evacuations are composed of blood alone, either pure or variously modified by disease. In point of fact, it appears, from the statements of Felix Plater and Sennertus,* that the subdivision of dysentery into a red and white species, in accordance with the presence or absence of blood in the stools, was of German origin, having been adopted by these writers from the German vernacular. Thus introduced into medical language, it has been employed by many notable writers,† but has deservedly fallen into disuse during the present century,‡ because blood may be either present or absent in almost every stage of the disease, and without regard to its severity or character in other respects.

Without entering upon a discussion of the various other subdivisions of dysentery proposed by medical authors, some of which, however, are subjoined in the footnote,§ the general course of the catarrhal and diphtheritic varieties will next be briefly sketched, after which some of the more important symptoms will be separately considered, and their relation to each of the two principal forms of the disease discussed.

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*Felix Plater—*Prax. Med.*, (1602–8,) *De vitiis*, Lib. II, Cap. 11, [Basel Ed., 1736, Tom. III, p. 701.]—says of bloody dysentery: "Our people (nostri) call it *Rote Ruhr Schaden*, or *Rotlauff*, from the redness of the blood;" but when mucous discharges predominate, "then the Germans are wont to call it white dysentery, *Weisse Ruhr*." Sennertus—*loc. cit.*, [in Opera, Paris, 1641, Tom. III, p. 123.]—expresses himself to the same effect: "If the blood predominates, the Germans call the species *die rote Ruhr*. If, however, more of that white mucus than of blood is expelled, they call it *die weisse Ruhr*." With the brief statement of Theophilus [see last note] compare the more elaborate account given by N. Lamusma—*Ventris Fluxus Multiplex*, Amsterdam, 1776, Cap. 2, p. 61, and Cap. 9, p. 104.

†For example, Michael Ettmüller—*Colleg. Pract. De Morb. Humani Corporis in Genere*, Pars I, Cap. 9, [in Opera, Lyons, 1690, pp. 125–6.]—tells us that in dysentery, besides sanies and pus with blood, a certain whitish mucus (albicantia mucilaginosa, mucus albicans) is excreted, and that "there is a dysentery which they call white, in which very little bloody matter, but an abundance of mucus is excreted." Th. Willis—*Pharmaceut. Rat.*, (1673.) Pars I, Sect. III, Cap. 3, [in Opera, Geneva, 1680, Tom. II, p. 73.]—makes the same species, calling them "aquosa" and "cruenta," and, in a subsequent passage, (p. 77.) speaks of the first as "incruenta." The following extract is from the English translation, London, 1684, p. 51: "For I have often and a great while since observed, that there are two very different sorts of this same Flux, which almost every year is wont to be so rife here about Autumn, and is commonly called in our language, *The Griping of the Guts;* in the one whereof the Stools were watery, and as it were, limpid [or clear] with a sudden weakning of the Body; in the other they are bloudy, but tolerable." So also Sydenham—*Med. Obs.*, Sect. IV, Cap. 3, [Transl. of Syd. Society, London, 1848, Vol. I, p. 167.]—mentions that blood was not always present in the stools of the epidemic flux he describes, and says: "Notwithstanding, provided that the motions be frequent, slimy, and attended with griping, the disease is a true bloody flux, or dysentery." According to Sprengel [*loc. cit.*, Bd. V. S. 337] the distinction between red and white dysentery was treated very fully by J. S. Carl—*Praxeos Med. Ther. Gen. et Spec.*, Halle, 1738, p. 87. I have not seen this work. Frid. Hoffmann—*Med. Rat. Syst.*, Tom. IV, Pars III, Sect. II, Cap. 7, § 5, [in Opera, Geneva, 1740, Tom. III, p. 152.]—considered this distinction as important as the division into benignant and malignant; and Sauvages—*Nos. Meth.*, Amsterdam, 1768, Tom. II, p. 325—admits *dysenteria alba* as his tenth species of dysentery, giving dysenteria incruenta, weisse Ruhr, and griping of the guts as synonyms.

‡Note, for example, C. G. Neumann—*Spec. Path. und Therapie*, Bd. I, Berlin, 1836, S. 287—who remarks "der Unterschied ist unwesentlich."

§Sauvages—*Nos. Meth.*, Amsterdam, 1768, Tom. II, p. 326 *et seq.*—makes the following species: 1, Dysenteria benigna spontanea; 2, d. catamenialis; 3, d. Parisiaca; 4, d. Gravidarum; 5, d. atrabilaria; 6, d. epidemica; 7, d. castrensis; 8, d. simulata; 9, d. Pecorum; 10, d. alba; 11, d. à mesenterii vomica; 12, d. à catharticis; 13, d. syphilitica; 14, d. æquinoctialis; 15, d. verminosa; 16, d. carnosa; 17, d. intermittens; 18, d. scorbutica; 19, d. Polonica; 20, d. miliaris. Besides these, he makes a separate heading of Hepatirrhœa or Dysenteria hepatica, which he divides into—1, Hepatirrhœa vera; 2, h. intestinalis; 3, h. à vulnere; 4, h. Mesenterica; 5, h. scorbutica; 6, h. cruenta; 7, h. intermittens. Cullen—*Apparatus ad Nos. Meth.*, Amsterdam, 1775, p. 192—retains the same species as Sauvages with the exception that he omits 8, d. simulata, and 9, d. Pecorum, and says that 3, d. Parisiaca and 12, d. à catharticis belong rather to diarrhœa. He divides the remaining species into two groups: 1, *Idiopathicæ* and 2, *Symptomaticæ*, of which the first embraces d. epidemica, d. castrensis, d. æquinoctialis, d. verminosa, d. carnosa, d. miliaris, d. intermittens, and d. alba; while the second includes the remaining species. Hepatirrhœa Cullen included with diarrhœa. Sagar—*Syst. Morb. Symp.*, (1771,) Vienna, 1776, p. 584 *et seq.*—makes the same species as Sauvages, except that he omits 10, d. alba, 11, d. à mesenterii vomica and 20, d. miliaris, and that he adds d. arthritica. He calls the d catamenialis of Sauvages, d. periodica; his d. à catharticis, d. medicamentosa; his d. Pecorum, d. epizootica; his d. intermittens, d. febricosa, and his d. Polonica, d. trichomatosa. In the case of Hepatirrhœa, he makes the same divisions as Sauvages, except that he called h. à vulnere, h. traumatica. Fournier et Vaidy—*Dict. des Sci. Med.*, Tome X, Paris, 1814, p. 315—divide dysentery into acute and chronic, subdividing acute dysentery into d. simple, d. inflammatoire, d. muqueuse, d. gastrique, d. compliquée avec le typhus, d. adynamique, d. ataxique, and d. avec une fièvre intermittente. John Mason Good, in his *Nosology*, (1817.) [Study of Med., Am. Reprint, Philada., 1825, Vol. V. p. 30.]—makes but two species: 1, d. simplex; 2, d. pyrectica; dividing the last into *a*, enumatodes, and *b*, typhodes. P. Vignes—*Traité Complet de la Dysenterie et de la Diarrhée*, Paris, 1835, p. 212—describes a benign form which he subdivides into "inflammatoire," "muqueuse" and "bilieuse," and a dysentery "de mauvais caractère," of which the varieties are "typhoïde, adynamique, ataxique," and "variétés combinées avec la fièvre jaune, et la peste dite d'Orient." He also describes chronic dysentery. M. L. A. Naumann—*Handb. der med. Klinik*, Bd. IV, Abth. 2, Berlin, 1835, S. 42 *et seq.*—describes 1 die einfache Ruhr, (d. catarrhalis, d. simplex, benigna;) 2, die gastrische Ruhr, (d. gastrica;) 3, die Ruhr mit Wechselfieber, (d. intermittens.) 4, die entzündliche Ruhr, (d. inflammatoria, sthenica.) 5, die faulige Ruhr, (die brandige, die Lagerruhr.) d. nervosa, asthenica, typhosa, septica, putrida, colliquativa, castrensis, pestilentialis; 1 luxus sanguineus.) H. Bressler—*Die Krankheiten des Unterleibes*, Berlin, 1841, Bd. I, S. 456 *et seq.*—describes 1 die einfache Ruhr, (d. simplex, catarrhalis.) 2, die entzündliche Ruhr, (d. inflammatoria;) 3, die gastrische Ruhr, (d. gastrica,) which is subdivided into d. biliosa and d. pituitosa; 4, die typhöse Ruhr, (d. typhosa, septica, putrida, castrensis.) J. Brown—in *Cyc. of Pract. Med.*, [Am. Ed., Phila., 1845, Vol. I, p. 730]—divides it into "the uncomplicated dysentery of temperate climates," and "tropical dysentery." J. Delioux De Savignac—*Traité de la Dysentérie*, Paris, 1853, p. 123—makes the following varieties: 1, simple ou catarrhale; 2, inflammatoire; 3, bilieuse; 4, typhoïde; 5, gangréneuse; 6, hémorrhagique; 7, athermique; 8, rheumatoïde; 9, chronique. A. Trousseau—*Clinique Méd.*, 2me Éd., Paris, 1865, Tome III, p. 162—describes, besides ordinary acute dysentery, "la forme bilieuse, d. inflammatoire," "la forme rhumatismale," and a "forme intermittente."

A. Simple Inflammatory Dysentery, (catarrhal dysentery; *Katarrhalische Ruhr* of the Germans.)—Simple inflammatory dysentery very frequently manifests itself during the course of an ordinary acute diarrhœa, which has already progressed, with the usual symptoms, for several days or weeks; but it also occurs as an independent affection, and then, very often, though not always, comes on after more or less protracted constipation. When it occurs as an independent affection it is usually preceded for some hours, or longer, by a sense of malaise, with uneasiness in the abdomen, or sensations resembling those of dyspepsia. To these succeed abdominal gripings, accompanied by a desire to go to stool. Sometimes the first stools are feculent and copious, but not unfrequently they are scanty, mucous, and without feculent admixture from the very first. Comparatively seldom does this milder form of dysentery begin with a chill followed by fever, as often happens in the diphtheritic form.

When the disease supervenes upon diarrhœa the stools sometimes suddenly acquire the dysenteric characters, which, however, more frequently are gradually developed. These characters, however the disease may have originated, are briefly as follows: At intervals abdominal gripings occur, generally in the umbilical region, but often extending thence along the ascending and descending colon, and accompanied by a dull pain in the loins and sacrum. These pains are quite like those which occur in severe cases of acute diarrhœa,* except that they are usually more intense. They are accompanied or followed by an urgent desire to expel the contents of the bowel, but the spasmodic contractions of the expulsive muscles that ensue only succeed, even after prolonged straining, in extruding a little mucus or muco-pus, which may or may not be mixed with blood; and this scanty discharge is not followed by the degree of relief which is noted after the discharges in acute diarrhœa, but painful sensations in the rectum and anus remain, even after a lull takes place in the repeated expulsive efforts. To the griping abdominal pains in dysentery the name of *tormina*, which Celsus applied to the disease itself, has long been given.† The painful expulsive efforts are called *tenesmus*, a term which the Greek physicians and their followers‡ applied to an independent disease. The paroxysms of tormina and tenesmus vary in frequency, with the intensity of the disorder, from every half hour, hour, or even longer intervals, to every few minutes; indeed, in violent attacks they sometimes follow each other at such short intervals that the patient is almost unable to leave the close-stool.

Notwithstanding these violent local symptoms there is often, at least at first, comparatively little constitutional disturbance. The appetite may continue to be normal or nearly so, there may be no complaint of thirst, but slight increase in the frequency of the pulse, and no sensible elevation of the temperature; but there is usually, even in these milder cases, a considerable sense of debility, so that the recumbent posture is desired, although various motives may lead the patient to resist this desire for a time. After the lapse of a day or so, however, and in the severer cases from the very first, the appetite diminishes or is altogether lost, and this is often accompanied by nausea and other evidences of gastric derangement, sometimes even by vomiting. The tongue becomes coated, there is some abnormal thirst, and often a moderate febrile reaction sets in, the pulse, however, seldom exceeding 90 to 100, and the temperature not often rising more than a degree or two above the normal range. The paroxysms of tormina and tenesmus are usually least frequent in

* *Supra*, p. 272. † *Loc. cit.* in note to p. 336, *supra*. ‡ See note to p. 236, *supra*, and p. 338.

the morning and during the early part of the day; they increase in frequency and severity during the afternoon and evening, and continue through the night, almost or altogether preventing sleep. By this disturbing influence, superadded to the depressing effect of the intestinal paroxysms, the patient is rapidly debilitated, and with the increasing exhaustion of the vital powers, anxiety, restlessness and other manifestations of nervous disorder make their appearance.

The disease now usually takes one of three directions: The symptoms may moderate and convalescence set in; they may become aggravated and the case may assume the characters of diphtheritic dysentery; or they may persist, with fluctuations in their intensity, and gradually pass into a chronic flux. In the most favorable cases, convalescence begins about a week from the time the stools first assumed the dysenteric character,* or it may be even earlier. The intervals of rest between the paroxysms of tormina and tenesmus become longer, and the paroxysms themselves less painful; but, usually, the first trustworthy symptom of approaching convalescence is the reappearance of feculent matters in the stools. The passage of consistent fæcal lumps (scybala) along with the dysenteric stools is not infrequent in the early stages of the disease, and may occasionally occur subsequently without being of favorable import; but when the muco-purulent or bloody discharges are replaced by semi-fluid feculent masses of the consistency of gruel or thicker, and of the ordinary fæcal odor, it warrants an expectation of speedy recovery, which is usually fulfilled if the stools continue to retain the feculent character.

In graver cases the dysenteric symptoms persist for ten days or two weeks, three weeks, or even longer, before convalescence sets in. These cases often pass into the diphtheritic form; in fact, as will be presently shown, a sharp catarrhal dysentery constitutes very generally the first stages of diphtheritic dysentery. But although this should not occur, if the disease persists beyond a week or ten days, it, nevertheless, usually produces great constitutional disturbance. The patient is worn out by loss of sleep, by the constant torture of the expulsive efforts, by the impaired nutrition, which, in spite of the wisest regimen, results from his disordered digestion,† and rapidly becomes emaciated. To these causes of exhaustion must be added the fever, which, in the graver cases under consideration, usually makes its appearance early in the disease, often assuming a remittent character, with exacerbations in the afternoon and evening. Sometimes the pulse is full and strong, the face flushed, and the temperature comparatively high, so far as can be judged

* G. B. WOOD—*Treatise on the Pract. of Med.*, 6th Ed., Philada., 1866, Vol. I. p. 714: "In the vast majority of cases, the disease takes a favorable turn between the sixth and tenth days, and the patient recovers." AUSTIN FLINT—*A contribution toward the natural history of acute dysentery; consisting of a report of ten cases observed without medicinal treatment*, The Amer. Jour. of the Med. Sciences, July, 1875—from the analysis of ten cases of acute dysentery observed without treatment, concludes, p. 39: "1, The disease in a temperate latitude tends, without treatment, to recovery; 2, It is a self-limited disease, and its duration is but little, if at all, abridged by methods of treatment now and heretofore in vogue; 3, Convalescence is as rapid when active measures of treatment have not been employed, as in cases actively treated; 4, Relapses do not occur in the cases in which the disease has been allowed to pursue its own course without active treatment; 5, Sporadic dysentery, in a temperate climate, does not eventuate in a chronic form of the disease." All of the ten cases observed terminated in recovery. The most protracted case lasted 21 days, of which 14 were occupied by the preliminary diarrhœa. The case of least duration lasted 6 days. The average duration of nine cases (excluding the one in which there was preliminary diarrhœa) was 10⅓ days. It is evident, from the clinical details of the cases, that these were all examples of mild catarrhal dysentery; and I must hold that this distinguished physician errs in regarding them as affording a picture of "acute dysentery"; they represent only one of its mildest forms. The same author previously published a *Clinical report on dysentery, based on an analysis of forty-nine recorded cases*, Buffalo Med. Jour., Vol. IX. [1853,] pp. 109, 136, 193 and 237. These papers were afterwards published as a brochure, the edition of which was unfortunately destroyed by fire, (see paper cited above, p. 27.) The value of this contribution was, however, diminished by the circumstance that it considers dysentery as a morbid entity, and does not attempt to discriminate between the milder catarrhal, and the more severe diphtheritic, forms. It is chiefly valuable from its hints as to the treatment, in connection with which I shall have occasion to cite it hereafter.

† It is an old observation, that the digestion is impaired during the progress of dysentery, especially if fever sets in. NICOLAUS PISO—*De cognoscendis et curandis præcipue internis humani corporis morbis*, Frankfort, 1589, p. 271—observed: "Dysentericus enim propter intestinorum et ventris imbecillitatem, haud multum potest concoquere, præsertim cum febricitat." And this, after all, represents substantially the conclusions arrived at by JULIUS UFFELMANN—*Die, Storung des Verdaunngs-processes in der Ruhr*, Deutches Archiv für Klinische Med., Bd. XIV, 1874, S. 228—who has endeavored to arrive at a knowledge of the nature of the digestive disturbances by an examination of the vomited matters (of cases in which vomiting occurs) and of the dejecta, and who has drawn some important indications with regard to the dietetic management of the disease from the phenomena observed

by the touch, for the clinical thermometer was not in use during the war of the rebellion. Sometimes with high temperature the pulse is frequent and feeble; but in the majority of cases the elevation of temperature, even when persistent, is moderate, and the pulse but little accelerated, though it loses in volume and becomes feeble and compressible. These cases sometimes terminate fatally, death being preceded by considerable emaciation; but it would appear probable, from the record of the autopsies made, that this was comparatively rare during the late war. More commonly, if such cases did not recover or pass into the diphtheritic form, they gradually assumed the characters of a chronic flux. A considerable number of the cases reported as chronic diarrhœa originated in this way.

Vesical tenesmus and prolapsus ani may accompany simple inflammatory dysentery, but are less frequent and less intense than in the diphtheritic variety. In distinguishing these two varieties, the greatest importance is to be attached to the examination of the stools. In simple inflammatory dysentery these consist of mucus, pus and blood variously commingled; but the shreds and flakes of pseudomembrane, and the characteristic sloughs of greater or less dimensions, which can always be recognized by the naked eye or the microscope in diphtheritic dysentery so soon as the infiltrated mucous and submucous layers undergo necrosis and begin to separate, are altogether absent.

B. Diphtheritic Dysentery, (pseudomembranous dysentery; *Diphtheritische Ruhr* of the Germans.)—In a large number of the cases observed during the late war, diphtheritic dysentery began with a simple inflammatory stage, either developed independently or supervening upon an acute diarrhœa. In numerous other instances it was more or less abruptly developed during the progress of a chronic flux, and indeed was a common mode of fatal termination in disorders of that class. These two categories embrace the vast majority of the cases. Occasionally, however, diphtheritic dysentery began with such abruptness and intensity as to countenance the assumption of Heubner* that a primary diphtheritic dysentery may occur without any preliminary catarrhal stage; but this more malignant form of the disease has probably been of more frequent occurrence in certain epidemics elsewhere than in our own camps.

The sketch already presented of simple inflammatory dysentery sufficiently describes the commencement of the large group of cases in which an acute diarrhœa, after lasting a few days or weeks, acquires the characters of that variety of dysentery before passing into the diphtheritic form. In these cases, after pursuing the course above outlined for about a week, instead of the favorable changes which prelude recovery, a more or less gradual aggravation of all the symptoms takes place. The patient grows more and more emaciated, debilitated, and ultimately sinks into a condition of collapse (the dysenteric collapse) with cool surface and extremities, and greatly enfeebled heart's action. With the progress of the disease his tongue becomes brown and dry, or smooth, red and dry, sometimes gashed; the anorexia and thirst become extreme; the abdomen tender to the touch, especially along the track of the colon, sometimes distended with flatus; the countenance sallow, at times it acquires a slight icteroid hue; the expression is anxious, and as one of the effects of the emaciation the features appear shrunken; from the same cause the eyes are sunken in the head, and are apt to acquire a vacant expression or a glassy stare.

* Heubner—Art. *Dysentery*, Ziemssen's Cyclo., Am. Ed., Vol. I, New York, 1874, p. 537, note: "This fact I would particularly emphasize in opposition to *Virchow*, who says, (*Kriegs-typhus u. Ruhr*, Virch. Arch., 52, p. 26,) 'Every dysentery is catarrhal at the outset.' These cases of dysentery where the whole intestine, from the lower part of the ileum down to the end of the rectum, is permeated with a continuous exudation, without any sign of an ulceration anywhere, must surely be regarded as rapid, primary diphtheritic affections."

These symptoms are accompanied or preceded by a change in the characters of the stools, which at first consist of stringy mucus more or less mingled with blood and pus, but now contain a quantity of yellowish or reddish morsels of various sizes, which on microscopic examination are recognized to be necrosed fragments of the diphtheritic layer. At the same time the mucus or muco-pus of the stools is mingled with a thin reddish serum, that sometimes entirely replaces it. In this fluid the morsels of necrosed membrane float, so that the passages have been compared to raw meat minced and stirred up with bloody water. Such stools have a peculiar cadaverous odor which is quite characteristic. About this time usually, though sometimes earlier, the skin around the anus becomes red and excoriated, and in some cases prolapsus ani is developed by the extreme tenesmus. So also, very often the patient begins to complain of strangury and vesical tenesmus. The quantity of urine is generally abnormally small, and proportionately concentrated and high colored; occasionally it is albuminous; sometimes there is almost complete suppression of the secretion.

Notwithstanding the extreme exhaustion of the patient, he often survives till the end of the second or third week from the commencement of the dysenteric symptoms, or even longer. In fact, Heubner is quite right in saying of these cases that they last "an entirely indefinite length of time;"* but usually, when they are protracted beyond the third or fourth week, this circumstance is accompanied by changes in the characters of the stools, which will be described further on. It is only too common for cases which have presented the symptoms just enumerated to terminate fatally. Death may take place at any time, but is, perhaps, more apt to happen during the third or fourth week than earlier or later. Usually, for a day or so before the fatal issue, the stools become brownish, red or blackish, of horribly putrid odor,† and often contain larger fragments of the necrosed mucous membrane than had previously been observed, though this is far from being uniformly the case. The surface of the body also exhales a putrid odor, which no degree of cleanliness can entirely obviate. Persistent hiccough often sets in during the latter stages of serious cases, and is always a symptom of evil omen.

A course quite similar to that just sketched is pursued by those cases which, instead of supervening upon an acute diarrhœa, begin as dysentery from the very first. These cases not infrequently commence with a chill followed by fever, and the abdominal symptoms make their appearance simultaneously or subsequently. In such cases the fever is usually more violent than in the form just described, and the afternoon temperature perceptibly higher.‡ There may be headache and even delirium, with flushed or dusky face and a full, strong, frequent pulse (95 to 110, or more) at the beginning, and this, after a few days, may pass into a fever of a typhoid type, with feeble, very frequent pulse, (110 to 140, or even more,) continued high temperature, sordes on the teeth, subsultus tendinum and muttering delirium. More frequently, however, even the cases which begin with sharp febrile symptoms soon pass into the characteristic condition of more or less complete dysenteric collapse, with but slightly elevated axillary temperature, cool surface and extremities, and a pulse which, although feeble, is either but little accelerated or may be actually slower than normal.

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* HEUBNER, Am. Transl., *op. cit.*, Vol. I, p. 553.

† The offensive odor of the dysenteric stools is alluded to by ARETÆUS, who ascribed it to the putridity of the ulcers.—*De Causis et Signis Morb. Diut.*, Lib. II, Cap. 9, [Ed. Boerhaave, 1731, p. 60.] CŒLIUS AURELIANUS also mentions it as "gravis fætor."—*Morb. Chron.*, Lib. IV, Cap. 6, [Ed. Amman, 1709, p. 525.]

‡ 104°.5 to 104° Fahr. HEUBNER, Am. Transl., *op. cit.*, Vol. I, p. 553.

When diphtheritic dysentery is developed during the progress of a chronic flux it is prone to occur suddenly and to prove fatal in a few days. The patient is already exhausted by the chronic disorder from which he has suffered for months, and has often reached an extreme condition of emaciation, though he may still be able to be out of bed a part of the day and walk about the wards or hospital grounds. In this condition, after some exposure to cold, some sudden change in the weather, some imprudence in diet, perhaps after going out on pass and indulging in a few hours' debauch, or perhaps quite as often without any assignable cause, the stools suddenly acquire the dysenteric characters. This is often accompanied at first by more or less febrile reaction, but fatal collapse speedily ensues.

In the more protracted cases alluded to above the disease is apt to pursue a less uniform course, and the patient seems better and worse at irregular intervals. The periods of temporary improvement usually coincide with the reappearance in the stools of feculent matters of the consistence of gruel or even of mush, which are more or less mixed up with the muco-pus, pus and blood of the discharges. During the periods of aggravation the feculent matters are apt again to disappear from the stools. These cases may terminate in recovery in the course of six weeks to two months from the commencement of the disease, may at any time prove fatal, or may pass into a chronic flux of indefinite duration.

Convalescence from diphtheritic dysentery is in any case usually a tedious process, and the more so in proportion to the violence and duration of the disease and the degree of exhaustion of the vital powers. Not the least difficulty consists in an extreme sensitiveness of the bowels which is often left behind, so that diarrhœa, or even a relapse of the dysenteric symptoms, is apt to be provoked by slight disturbing circumstances, such as trifling imprudence in diet and exercise, or exposure to the vicissitudes of the weather. With these paroxysms of diarrhœa periods of constipation frequently alternate.

The foregoing sketches present an outline of the symptoms which occur in the most common forms of ordinary uncomplicated dysentery. This picture is sometimes considerably modified by apparent convalescence setting in at any stage of the disease, and followed, after a delusive respite, by fatal collapse;* or still further modifications may ensue when the dysenteric attack is complicated with other diseases, especially by malarial and typhoid fevers, the scorbutic taint or some intercurrent phlegmasia. Some of the more important of these complications will be discussed in a subsequent portion of this section, before which it will be convenient to offer some additional details with regard to a few of the more important symptoms.

* While writing the above paragraph a report was received at the Surgeon General's Office from Assistant Surgeon J. V. R. Hoff, U. S. A., in the case of Chaplain C. L. R., U. S. A., which illustrates this remark. The patient was taken with diarrhœa some little time before dysenteric symptoms set in, and it is stated that about the time the looseness first appeared a disagreeable occurrence had worried him considerably and caused him to become mentally depressed. November 12, 1875, while suffering from the diarrhœa, he took a long, cold and tiresome ride from his post (Fort McPherson, Nebraska) to the North Platte, and after reaching there took to his bed. A physician was called, and dysentery diagnosticated. He subsequently returned to Fort McPherson, where, November 14th, he was placed on sick report, and on the 18th was seen by Dr. Hoff in consultation with Acting Assistant Surgeon C. F. Stevens, who attended him. After giving the history of the symptoms of the case at some length, Dr. Hoff remarks: "To sum up the case: The actual outbreak of the disease, which we may safely assume as occurring at North Platte, November 12th, was preceded by an indefinite constitutional disturbance, irregularity of digestion, loss of appetite, thirst, pain and diarrhœa. On that day the bowels were moved repeatedly, the motions being preceded and followed by severe pain, giving the characteristic tormina and tenesmus of dysentery. The evacuations consisted of muco-bloody masses mixed with hard scybala, and occasionally were apparently of pure blood. The patient soon became pale, and seemed to suffer great mental depression; was irritable and disinclined to the slightest exertion, (which his family informed me was always his manner in sickness,) but did not seem to lose flesh to any great extent. At the time of apparent convalescence the dejections, I am told, became more natural in color and consistence, growing brownish, feculent and less frequent, the pulse became stronger and the mind clearer. At this time I felt safe in prognosticating, with ordinary care, the patient's return to health through a protracted convalescence, and suggested a change of air. December 11th, the picture changed. The disease seemed again to become active; the tormina returned; the passages assumed a blackish color and carrion-like odor, and were mixed with discolored shreds of mucous membrane. The pulse became small and frequent; the extremities cold; the mind slightly wandering. Then the abdominal pain ceased; the disease became adynamic; the thin, black, stinking dejections, though few, were at the last passed involuntarily, and, finally, he died December 24th. No autopsy was permitted."

THE DYSENTERIC STOOLS.*—The great variety of appearances presented by the discharges from the bowels in dysentery result from the admixture of a comparatively small number of ingredients, with regard to each of which a few remarks will be offered. These are: 1, feculent matters; 2, mucus, pus and various admixtures of the two; 3, blood and bloody serum; 4, portions of pseudomembrane and of the necrosed intestinal coats; 5, bacteria and other parasitic forms; 6, accidental matters derived from the food and medicines taken. Of these ingredients, the second are common to simple inflammatory dysentery and the early stages of the diphtheritic variety. The fourth are characteristic of diphtheritic dysentery. The other ingredients may be found under various circumstances at almost any stage of either variety.

1. *Feculent matters.*—As already mentioned, in the majority of cases true feculent matters almost entirely disappear from the stools so soon as dysentery is fairly inaugurated. If diarrhœa has not preceded the dysenteric attack, the first few evacuations are apt to discharge all the feculent matters contained in the lower bowel, and no more are formed until the violence of the disease is spent. The same result is still more thoroughly effected when diarrhœa has been the first stage of the disease. Stoll was therefore right in the main when he classed dysentery among the "morbi alvum occludentes."† Nevertheless, small quantities of feculent matters do sometimes appear in the stools. Thus, when the disease has been preceded by constipation, the hardened fæcal matters impacted in the pouches of the colon may not all be discharged at first, but from time to time during the progress of the disease, especially during its early stages, little rounded balls of hardened fæcal matters, conditioned in size and shape by the pouches in which they have been retained, come away with the evacuations. These small, hard, fæcal masses, which are designated scybala,‡ are by no means invariable concomitants even of the early stages of

* For a general account of the characters of the stools in disease and incidentally in dysentery, see, besides the works referred to in subsequent notes, HIPPOCRATES, *Prenotions of Cos*, [Ed. Littré, V, p. 721,] and *Prognostics*, [Id., II, p. 135;] THEOPHILUS, *De Retrimentis Alvi*, [Greek-Latin Ed., bound up with the *Libellas de Urinis* of the same author, Leyden, 1703;] N. LAMBSMA, *Ventris Fluxus Multiplex*, Amsterdam, 1756; L. GITSCHIN, *Diss. de Semiologia Dejectionis Alvi*, Prag., 1835; TH. L. GILBERT, *Diss. de Signis ex Faecibus*, Berlin, 1841; H. LEBERT, *Physiol. Path.*, Paris, 1845, Tome I, p. 220; F. GÜNSBURG, *Die Path. Gewebelehre*, Bd. II, Leipsic, 1848, S. 277, Diagnostische Untersuchung der Darmexkrete; and WILHELM LAMBL, *Mikroskopische Untersuchungen der Darm Excrete*, Prager Vierteljahrschrift für die Prakt. Heilkunde, 1859, I, S. 1, with 4 plates.

† STOLL—*Rat. Med.*, Pars III, Sect. 4, Cap. 4, p. 284, ed. cited *supra*, p. 342—"Ea certe est dysenteriæ legitimæ conditio, ut hunc morbis adnumeres alvum potius occludentibus."

‡ The Greek word Σκύβαλον properly means merely fæcal matter (stercus) without regard to its degree of hardness or dryness. It is used in this sense by ARETÆUS, for example, in his chapter on dysentery—*De Causis et Signis Morb. Diut.*, Lib. II, Cap. 9, [Ed. Boerhaave, pp. 60 and 61.] He explains that fæcal matters (skubala) when mixed with the bloody discharges may be either dissolved in them, or may be dry and consistent, in the latter case being lubricated with the surrounding fluid. ST. PAUL seems to have used it in the same sense in Philippians, 3, 8: "For whom I have suffered the loss of all things, and do count them but dung, that I may win Christ." The word here translated dung is σκύβαλα. This word is also used by certain writers in a broader sense to mean generally dregs, refuse, &c., as, for example, by DIOSCORIDES in the fifth book of his *Materia Medica*, where, in describing the preparation of Pompholyx, (sublimed zinc,) he directs it to be enveloped in a piece of linen and washed out, and speaks of the sediment which remains on the cloth as σκύβαλον. RUELLIUS, in his version of DIOSCORIDES, translates this word "sedimentum," [I cite the Greek-Latin Ed., Paris, 1549, Lib. V, Cap. 85, f. 283,] while MARCELLUS VERGILIUS translates it "quod vero inutile et durum;" [I cite the Greek-Latin Ed., Colonia, 1529, Lib. V, Cap. 43, p. 649.] The division of the different editions into chapters varies greatly; thus GORRÆUS [*vide infra*] cites this passage as Lib. V, Cap. 77, without mentioning the edition, and this reference is repeated by subsequent writers. GALEN—*Comm. IV in Hippoc. de Acut. Morb. Victu*, § 15, [Ed. Kühn, XV, pp. 760–1,]—appears to have been the first to use the word in its modern sense. In speaking of ardent fevers (causus) he applies it to hard fæcal lumps, parched by the inflammation of some viscus, and resembling the droppings of goats, (goats' pills;) but GALEN himself elsewhere uses the word to signify fæcal matter merely, without reference to its character, as in his *Comm. I, in Hippoc. de Humor lib.*, § 12, [Ed. Kühn, XVI, p. 146.] I may add that the comparison of hard balls of fæces to the excrements of goats is probably very old. See the Hippocratic treatise *Prenotions of Cos*, Sect. II, Par. 26, [Ed. Littré, V, p. 689,] where such stools are spoken of as occurring in dropsy. GORRÆUS—*Def. Med.*, [Opera, Paris, 1622, p. 579,]—in defining the term scybala, gives both meanings, but prefers to apply it to very dry excrements formed into a nucleus; and JAMES—*Med. Dict.*, Vol. III, London, 1745—says: "*Scybalo*—Excrement indurated in lumps." In this latter sense it has since been generally employed. CŒLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 6, [Ed. Amman, 1709, p. 525,]—speaks of the frequent occurrence of condensed fæcal matters [coacta stercora] in the dysenteric stools, but neither he nor subsequent writers for the most part appear to have attached much importance to their appearance until the middle of the last century, when CLEGHORN—*Obs. on the Epidemical Diseases in Minorca*, 1751, (I cite from the 4th Ed., London, 1779, p. 252,]—suggested that possibly they might sometimes be the cause of dysentery, saying, in giving reasons for the use of purgatives in the treatment, that "hardened excrements are for the most part, either the cause or the consequence of the disease." PRINGLE—*Obs. on the Diseases of the Army*, London, 1752, Part 3, Chap. 6, p. 258—who did not adopt this view of the causation of dysentery, nevertheless attached great importance to the presence of scybala, remarking, in the first edition of his work, that 'they keep up the irritation and protract the disease, when it would otherwise have ceased," and in the last edition [7th Ed., London, 1774, p. 229] substituting the following passage: "The balls of hardened fæces may come away at any time of the disease, but I have observed them mostly in its advanced state, and when I suspected that purging had been too long neglected. I have commonly seen the tenesmus and

dysentery, their presence or absence being related to the degree of the constipation which so often precedes the dysenteric attack.

In cases which begin to improve, whether permanently or temporarily, feculent matters again make their appearance in the stools. This may also happen at any period in the progress of those cases in which the morbid process on which the dysentery depends is limited to the descending colon and rectum, or is so distributed as to leave irregular territories of the mucous membrane of the large intestine in a condition approximating the normal. Usually, however, it is only when the violence of the disease is spent, for the time at least, that feculent matters reappear in the discharges. These matters, then, vary greatly in character, in accordance with the condition of the hepatic secretion and the manner in which the digestive processes are performed in the stomach and small intestine. Deficient hepatic secretion would appear to be a common condition, in consequence of which the feculent matters passed are clay-colored, ash-colored, grayish or whitish;* and with

all other symptoms give way, after they were carried off by a brisk purge. These scybala are of so firm a texture, and so round, that they seem to have been formed in the cells of the colon, and to have lain there from the beginning." MOSELEY—*Treatise on Tropical Diseases*, [3d Ed., London, 1792, p. 233,]—took a very similar view: "Another cause of obstinacy in the flux, is indurated fæces, lodged in the intestines; and though the patient shall have been repeatedly purged, and taken nothing but fluids during his illness, it is amazing what scybala, or lumps of excrement, will sometimes be brought away, by a repetition of the antimonial purgative, after an interval of several days." Meanwhile, L. CHALMERS—*An Account of the Weather and Diseases of South-Carolina*, London, 1776, Vol. II, p. 31—had expressed the opinion that tenesmus and dysentery "for the most part arise in this climate from costiveness;" and CULLEN—*First Lines of the Practice of Physic*, [I cite the Ed. of 1778-79, Vol. II, p. 379,]—sought the proximate cause of dysentery in general in a preternatural constriction of the colon, causing the retention of the fæcal matters, pointing out that when scybala "are voided, whether by the efforts of nature, or, as solicited by art, they procure a remission of all the symptoms, and more especially of the frequent stools, griping, and tenesmus," (p. 373.) So also ANNESLEY—*Diseases of India*, London, 1828, Vol, II, p. 241—regarded accumulations of fæcal matters in the colon as among the most powerful predisposing causes of dysentery; and VIRCHOW—*Unterleibsaffectionen*, Archiv (1853) V, p. 352—who supports this view in an exceedingly ingenious manner, makes fæcal accumulations play an important part in the causation of the disease. In this connection the reader may also consult with advantage the dissertation of PAUL SENEBIER—*Des Scybales*, Paris Thesis, No. 179, 1873—who defines scybala as "Very hard intestinal concretions which are generally globular, of clay-like aspect, and vary in size from that of a bird's egg to that of a large orange, or larger. They are composed of fæcal matters, the liquid part of which has been reabsorbed. In certain cases scybala are incrusted with calcareous salts and thus form enteroliths," (p. 7.) According to the author, scybala are found most frequently in the rectum, next in the cæcum, then in the sigmoid flexure and colon. They may even fill the whole of the large intestine, as in Obs. VIII, p. 20. They are caused either, 1, by mechanical obstructions, or, 2, by physiological causes, such as enfeeblement of the intestinal functions of secretion and peristaltic motion, or augmentation of the absorptive process. See also A. RACIBORSKI—*Les Tumeurs Stercorales*, Paris Thesis, No. 370, 1834—who reports two interesting cases of notable fæcal accumulation; and the paper of A. H. HENROT—*Des Pseudo-étranglements*, Paris Thesis, No. 94, 1865—in which it is shown how intestinal paralysis may produce obstruction and fæcal accumulation. (Here belong observations 21 to 35.) With regard to the *enteroliths* referred to by SENEBIER, a word may be said. GALEN thought the occurrence of intestinal calculi improbable. He says—*De Loc. Affect.*, Lib. VI, Cap. 2, [Ed. Kühn, VIII, p. 384,]—"Some writers mention that after vehement attempts at stool, preceded by severe pain, certain callous stones have been voided similar to those which originate in the bladder; which I myself have never seen, nor have I ever heard of any one who has." Nevertheless, the occurrence of such calculi has been fully established. Besides the frequently-occurring biliary calculi, concretions of various characters originate in the intestinal canal. The subject is not so connected with dysentery as to make it desirable to discuss it fully in this place, but I may refer to ALEX. MONRO, JR.—*Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, Edinburgh, 1811, p. 25—in whose book the reader will find numerous references to cases scattered through the older literature, and a description of 42 specimens collected by the author's father. A large part of these calculi proved, as was first shown by Dr. WOLLASTON, to be composed of vegetable hairs derived from the oatmeal which forms so important a part of the diet of the laboring classes in Scotland. See ALEX. MARCET—*Essay on Calculous Disorders*, London, 1817, p. 129; and R. QUAIN—*Diseases of the Rectum*, 2d Ed., London, 1855, p. 320. But this is by no means the only variety of intestinal calculi. See the two authors just cited, also BOYER—*Traité des Mal. Chir.*, 4me Éd., Paris, 1831, Tome X, p. 41 *et seq.*—who describes concretions of hardened fæcal matters under the designation "pierres stercorales;" and the interesting dissertation of JULES CLOQUET—*Mémoire sur les Concrétions Intestinales*, [read to the Acad. of Sci., Jan. 29, 1855.] Paris, 1855. This author classes the intestinal concretions of both man and animals as: 1, Concretions of inorganic salts around a hard nucleus (bézoards) comparatively frequent among animals, but rare in man, though they do sometimes occur; 2, Hair balls coated outside by a delicate layer of carbonate and phosphate of lime, (égagropiles.) These are common in ruminating animals, but in man they occur almost exclusively in countries where oatmeal is much used as food, as in Scotland, Brittany, &c. The hairs of the grain, mixed with the imperfectly-prepared flour, mat together in the intestines around the stone of some fruit or any other similar body, as a nucleus. He mentions also the observations of the elder LAUGIER (Mémoires de l'Acad. de Méd., Tome I, Paris, 1828, p. 415) of a concretion composed of the fibres of liquorice root, which the patient habitually chewed, and three cases of true hair balls in individuals who, from a sort of monomania, were in the habit of swallowing hair. 3, Masses of hair without an outside coating. Besides these varieties of concretions, the author mentions as peculiar to the human species, (a) concretions of magnesia in persons who abuse this drug, and (b) rounded, semitransparent, elastic masses of caseine in infants, and even in adults on a milk diet. Consult also COPLAND—*Art. Concretions, Intestinal*, Med. Dict., Vol. I, p. 397; and BAMBERGER—*Kothgeschwülste und Darmsteine*, in Virchow's Handbuch der Spec. Path. und Ther., Bd. VI, Abth. I, Erlangen, 1855, S. 464.

* I still hold to the opinion that stools of the characters indicated are sufficient evidence of a deficiency of biliary matter in the alimentary canal, notwithstanding the hypothetical suggestions of THOMAS INMAN—*Letter to British Medical Journal*, Dec. 15, 1860, p. 985—that the "brown colour of the stools is due to a secretion from the colon," and is no wise dependent on the bile. The only fact brought forward to sustain this speculation is the well known circumstance that the intestinal contents do not acquire the peculiar brown color of fæcal matter until after they enter the colon. ROBERT LAWSON—*Some observations on the urinary and alvine excretions as they appear within the tropics*, British and Foreign Med. Chir. Review, October, 1861, p. 483—favors the same view, stating in support of it that in normal excrement the "epithelium and granular matter" contained in the fæcal mass "is all impregnated with a brown pigment" which "is usually the only colouring matter to be seen, and nitric acid does not produce in it the characteristic reaction of bile." The first of these circumstances has nothing to do with the origin of the pigment; the last I readily admit. Whenever death takes place at the proper stage of digestion, and often at other times, the biliary coloring matter is recognizable as such in the small intestine. In the large intestine of healthy adults, however, it is transformed into the well known brown color, which no longer gives the bile reaction with nitric acid. That, nevertheless, this normal brown color is formed at the expense of the biliary secretion is easily shown by diverting that secretion from the intestinal canal of dogs by

varying digestive energy and diet, the products of the digestive process vary from a uniform pap to a mixture of fragments, which even by the naked eye are recognized to consist of undigested food. Either of these conditions may occur in acute dysentery, particularly in its later stages, and especially in protracted cases. Both of them are common enough in the chronic fluxes.

2. *Mucus and pus.*—Mucus appears in the stools at the commencement of the dysenteric attack in glairy, translucent, sometimes yellowish masses, somewhat resembling the white of an egg to the naked eye. These masses possess considerable cohesion, so that when the attempt is made to lift them with forceps they draw out into strings, and when it is desired to remove morsels for microscopic examination this is best done with the aid of scissors. After a time the mucus becomes more opaque, whitish and yellowish, and is then described as muco-pus; or it may altogether lose its stringy quality and become yellow and miscible with water, and then is properly described as pus.

With the microscope, elements resembling the white corpuscles of the blood are found in all these fluids. They are least numerous in mucus, in which they are called mucous corpuscles; more numerous in muco-pus, and most so in pure pus, in both of which they are called pus corpuscles. As already shown,* there is no specific difference between the mucous and pus corpuscles, which are identical in all essential morphological particulars and originate in the same way. Both, when recent and at the temperature of the body, are capable of the amœboid movements described by Max Schultze† in the white corpuscles of the blood, and in both, when this property is lost by lowered temperature, dilution of the fluid in which they float, lapse of time or other causes, an active molecular dance of the granules they contain sets in, followed by a rupture of the protoplasmic mass with discharge

ligature of the common bile duct, or by the establishment of biliary fistulæ. The stools immediately lose their normal color, and do not regain it so long as the bile is excluded from the alimentary canal. Thus TIEDEMANN and GMELIN, [*loc. cit.*, p. 284, *supra*,] in a number of dogs in which they had ligated the common bile duct, found that after the second or third day the stools became grayish-white or clay-colored ("une teinte d'un blanc grisâtre, argileuse") and retained these characters as long as the animal lived, except in two instances, in one of which after the tenth day, in the other after the fifteenth, the stools regained their normal color. In both these instances it was found on post mortem examination that the bile duct had again become patulous and the bile had once more gained access to the intestine. F. ARNOLD—*Zur Physiologie der Galle*, Mannheim, 1854—established a successful biliary fistula in a dog and found the stools clay-colored while the animal was fed on flesh; subsequently he was fed on rye bread, and the fæces acquired a yellowish-gray color derived from the bread, (S. 15.) The *Report of the Edinburgh Committee on the action of Mercury, &c.*, cited p. 276, *supra*, relates in Part II the particulars of no less than nine successfully established biliary fistulæ in dogs. In every instance (except No. 7, in which mention of the color of the stools was accidentally omitted) it is expressly stated that the fæces became clay-colored. The same circumstance was noted by AUSTIN FLINT, JR., in his successful case of biliary fistula, (*op. cit.*, p. 284, *supra*.) In the face of positive evidence of this kind, the speculations of INMAN and LAWSON appear of little force. LAWSON cites in support of his views the remarks of HENRY HOLLAND—*Medical Notes and Reflections*, Chap. XIII. On some points in the pathology of the colon, Amer. ed., Philadelphia, 1839, p. 109—who has expressed the opinion that "many of the various egesta from the bowels, usually termed bilious," are in fact "separated from the vessels or glands of the larger intestine by exudation or secretion." The ingenious author specifies "the peculiar matter, resembling coffee-grounds" as an example, expresses the opinion that it is "separated in great part in the lower intestines," and adds: "Those secretions also which resemble chopped grass or spinach have probably the same origin; and even of the liquid which is called green bile it is doubtful what proportion may come from the liver. The colour of what passes from the bowels is often the effect of changes taking place within the intestine itself," (p. 110.) These conjectures, however, are unsupported by any experimental evidence, and therefore have little value. The "coffee-ground" discharges are shown by the microscope to owe their appearance to the presence of altered blood, but this fact has no connection with the normal color of the stools. LAWSON further cites, in support of his views, a case reported by FERICHS—*Diseases of the Liver*, Transl. of New Sydenham Society, London, 1860, Vol. I. p. 138, (Obs. No. 6,) in which it is stated that the "colour of the stools was somewhat brownish, not owing, however, to the admixture of bile-pigment, but as shown by the microscope, to numerous epithelial cells containing pigment, derived from the mucous membrane and glands of the intestine." Now this was a case of occlusion of the bile ducts by a cancerous growth; there was intense jaundice; the skin had "assumed a bronze colour;" the urine was "brownish-black." If the observation of FERICHS was correct, which I do not doubt, the intestinal epithelium had, like the skin, become infiltrated with altered bile-pigment—that is all. LAWSON himself cites, as an observation "more to the purpose," a case of diarrhœa in which the stools were dark-brown, and contained epithelial cells "deeply tinged with a brown colour," although "no blood globule was seen among them," and considers this "conclusive as to the possibility of colouring matter being obtained from the intestine." There is a strange confusion of ideas in all this, for there is absolutely nothing in LAWSON'S case, as he reports it, to show that the epithelial elements observed had not obtained their color after separation by imbibition from the intestinal contents. Normally the intestinal epithelium is quite colorless. In FERICHS' case the cause of its abnormal color is patent. Now I do not for a moment deny that the stools may become brown in the absence of the products of bile-pigment, from the presence of altered blood, from certain ingesta, &c. AUSTIN FLINT'S dog (*loc. cit.*) on one or two occasions passed "quite dark" stools; (the tint is unfortunately not specified.) But these facts are not to be interpreted as in any way contradicting the general truth that the products of the decomposition of bile-pigment give color to the stools in the normal state, and that variations in the original quantity and quality of the biliary secretion, as well as in the subsequent decompositions which this fluid normally undergoes in the alimentary canal, are important factors in modifying the color of the stools in disease.

* *Supra*, p. 278.

† MAX SCHULTZE—*Ein heizbarer Objecttisch, &c.* [Archiv für Mik. Anat., Bd. I, S. 1.] For a detailed description of similar amœboid movements in the pus corpuscles, see F. v. RECKLINGHAUSEN—*Ueber Eiter- und Bindegewebskörperchen*, [Virchow's Archiv, Bd. XXVIII, 1863, S. 157.]

of the granules and subsequent collapse, as is also readily observed in the so-called salivary corpuscles, which are doubtless of the same nature and origin, and in the white corpuscles of the blood after the dilution of that fluid with water.

The essential difference between mucus and pus, as discharged from mucous membranes, resides then, not in the contained corpuscles, but in the material containing them. Mucus is characterized by the stringy, cohesive nature of this material, and its reaction with dilute acetic acid, which precipitates filaments and flakes of mucin* soluble in dilute alkalies, while pus is characterized by the fact that the corpuscles float in a serum containing albumen. In muco-pus the two substances are mingled in various proportions. These substances may be passed without much admixture of other matters, constituting the mucous or muco-purulent stools; may form a coating to scybala, or may be variously mixed with blood, bloody serum, feculent matters, etc. When the mucus is mingled with watery discharges, as sometimes happens, especially in the early stages of dysentery, or when water is purposely mixed with it, it can often be unfolded into hyaline membranes or shreds which float in the fluid.† Whether the jelly-like bodies often seen, which have been compared to sago grains or frogs' eggs, are ever composed of mucus, appears so doubtful that they will be described under the head of "accidental matters derived from the food and medicines taken." The watery discharges just referred to sometimes also contain more or less albumen, as will be presently described under the head of "blood and bloody serum."

The presence of mucus and pus in the dysenteric stools has been recognized from the earliest times;‡ but the old Greek physicians described also the appearance of a certain fatty substance in the stools, especially during the early stages of dysentery. Mentioned by Hippocrates and Archigenes, and more fully expounded by Galen,§ the belief that fat was an ordinary constituent of the dysenteric stools continued to prevail among medical men until more correct views of the nature of the substance in question were propounded at the commencement of the seventeenth century by Felix Plater, Riverius and Sennertus.‖ It would appear from their writings that most probably the opaque, whitish, muco-purulent

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*Lehmann—*Phys. Chem.*, [Transl. of Cavendish Soc., Vol. II, London, 1853, p. 371 *et seq.*]—gives a good account of the chemical relations of mucus. See also Simon—*Animal Chem.*, [Transl. of Sydenham Soc., Vol. II, London, 1846, p. 73.]

† Heubner speaks of these as "shreddy" stools,—Vol. I, p. 549, *op. cit.*, *supra*, p. 330, Amer. transl.,—but these shreds rarely attract attention as such, unless specially searched for, on account of their delicacy. The true shreddy stool is that which contains shreds and pellicles of pseudomembrane and fragments of necrosed mucous and submucous tissues.

‡ Thus in the Hippocratic treatise—*Prenotions of Cos*, Sect. VII, § 606, [Ed. Littré, V, p. 725,]—we are told that phlegm-like (φλεγματώδης) stools, if acute and with cardialgia, indicate dysentery; and in Sect. II, § 455, [p. 687,] that in acute dysentery, when the stools become purulent (πυώδεα) what floats on their surface is very white and abundant. So also Celsus—Lib. IV, Cap. 15, [Leyden Ed., 1785, p. 179,]—speaks of the dysenteric stools as mixed with mucus: "cum quibusdam quasi mucosis."

§ Hippocrates—*Epidem.*, Lib. III, Sect. 3, § 8, [Ed. Littré, III, p. 87,]—describes the stools in certain cases of dysentery as "bilious, fatty, (λιπαρὰ,) thin and watery." Archigenes, according to Ætius—Tetrab. III, Serm. I, Cap. 43, [Lyons Ed., 1549, p. 599,]—spoke of the fatty matter as appearing in the early stages of dysentery, and supposed it to be derived from the melting of the fat which he erroneously believed to exist normally on the interior surface of the bowel. Galen—*De Loc. Affect.*, Lib. VI, Cap. 2, [Ed. Kühn, VIII, p. 384,]—taught that the appearance of matter resembling fat (πιμελώδες) in the dysenteric stools, along with the shreds of intestine, (ξύσματα,) was an indication that the large intestine was ulcerated. I find these fatty matters alluded to, and described as occurring in dysentery, by many subsequent writers, among whom I may mention Cælius Aurelianus—*Morb. Chron.*, Lib. IV, Cap. 6, [Amman's Ed., p. 536,] and Alexander of Tralles—Lib. VIII, Cap. 9, [Basel Ed. of 1556, p. 455.] Fernelius—*Patholog.*, Lib. VI, Cap. 10, [Paris Ed., 1554, p. 187,]—described and explained these supposed fatty matters almost as had been done by Archigenes and Galen; but Hollerius—*De Morb. Intern.*, Lib. I, Cap. 40, Scholia, [Venice, 1572, f. 124,]—while doing the same, pointed out that many persons had deceived themselves and mistaken other substances for fat, and suggested that suspected substances should be thrown on live coals, when fat would melt and give off a characteristic vapor, while fleshy substances would blacken and dry up. This would also serve to distinguish mucus.

‖ Felix Plater—*Praxeos*, De Vitiis, Lib. II, Cap. 11, [Basel Ed., 1736, Tom. III, p. 794,]—speaks of mucus and pus as being voided along with blood, &c., in dysentery. He says that the mucus has been falsely taken for fat, and remarks that the common opinion that this has its origin from the fat on the interior surface of the intestines, is erroneous, since there is really no fat there, but only on the exterior surface. Riverius—*Prax. Med.*, Lib. X, Cap. 6, [Opera, Lyons, 1679, p. 301,]—denies that the whitish mucous substance (illud mucosum et album) which is so plentifully excreted in dysentery, mixed with blood and other humors, is fat, nor does he admit that it is either the natural mucus of the intestines or pus from the dysenteric ulcers; he believes it to be rather a peculiar secretion from the diseased surface, and compares it to the discharge which takes place from the eyes in ophthalmia, or from the bronchial tubes in affections of the lungs in which no ulcers exist. Sennertus—*Pract. Med.*, Lib. III, Pars 2, Sect. 2, Cap. 7, Quæstio 1, [Opera, Paris, 1641, T. III, p. 184,]—devoted to the subject a dissertation in which he maintains a view almost identical with that of Riverius.

matters, so frequently observed in the stools during sharp dysenteric attacks, constituted what was supposed to be fatty by the ancients. This fatty matter must not be confounded with the suet-like lumps described by Aretæus, and subsequently known as corpora pinguia. These will be more particularly referred to hereafter in connection with the so-called sago-grain bodies.

3. *Blood and bloody serum.*—More or less blood is very often present in the dysenteric stools. It may appear as streaks upon the feculent or mucous masses, or may be more or less intimately commingled with the other ingredients in fluid stools. The quantity may be so small that it can only be recognized with certainty by the microscope, or so large as to threaten death by hæmorrhage. It may result from capillary rupture, conditioned by the intense hyperæmia accompanying the inflammatory process, or from the erosion of larger vessels during the progress of follicular ulceration, or the separation of diphtheritic sloughs and the ulceration which succeeds that process.* In the great majority of cases the hæmorrhage is moderate in quantity, and the blood passed is more or less intimately mingled with the other ingredients of the dejecta. As a rule it is only in those who are constitutionally prone to hæmorrhage, as in scorbutic patients, that bulky hæmorrhages occur producing stools composed entirely of blood.

Blood may make its appearance in the stools during various other diseases than that under consideration. Not only may this occur in diarrhœa and typhoid fever, but also in individuals who are not laboring under any intestinal flux. Hæmorrhoids, eroding ulcers of the duodenum, cancer and tubercular disease of the bowels are familiar illustrations. So also in epistaxis and hæmoptysis, or in cancer and other diseases of the pharynx and œsophagus, blood may be swallowed and make its appearance in the stools; and in hæmorrhage into the stomach from any cause, a portion of the blood may pass downward and be expelled through the intestines.

Besides these various sources of blood in the stools, hæmorrhage from the intestines may occur from rupture of the capillaries of the mucous membrane of the bowel in various conditions in which that membrane itself is not the seat of any recognizable organic disease. This may happen from mechanical obstructions of the portal circulation, such as occur in valvular disease of the heart and in cirrhosis of the liver,† or in consequence of a depraved condition of the blood, as in certain cases of scurvy, yellow fever and hæmorrhagic malarial fever.‡ Hæmorrhages from the intestines also occasionally occur in those who abuse alcoholic beverages, though perhaps less frequently than hæmorrhages from the stomach in the same class of persons. These hæmorrhages are probably determined in most cases by the existence of cirrhosis of the liver, but also in some of those in which the hæmorrhage takes place in the stomachs of spirit-drinkers by congestion, or even chronic inflammation and ulceration of the mucous membrane of that organ from the local irritation. In these

* The latter accident was long ago described by ARETÆUS—*De Causis et Signis Morb. Diut.*, Lib. II. Cap. 9. [Ed. Boerhaave, p. 62.] who says that in some cases a large slough (μεγάλη ἐσχάρη) separating, occasions a considerable aperture in a vein and gives rise to dangerous hæmorrhage.

† F. T. FRERICHS—*Diseases of the Liver*, [Transl. of New Sydenham Soc., London, 1860-1,]—gives a number of cases of hæmorrhage from the stomach, intestines, or both, in various diseases of that organ; for example, in acute atrophy of the liver, Vol. I. p. 214; in chronic atrophy, *ib.*, pp. 268 and 272. In connection with the pigment liver of intermittent fever, he says, *ib.*, p. 316: "Intestinal hæmorrhages I have observed on three occasions; the bleedings were intermittent, and came on each time with the paroxysm of the fever; they were not affected by any treatment directed against the hæmorrhage, but yielded to large doses of quinine." He states that in cirrhosis of the liver capillary hæmorrhages from the stomach and bowels are not very uncommon, Vol. II, p. 49, but that "exhausting hæmorrhage from the intestinal canal is rare," *ib.*, p. 17. He gives cases of intestinal hæmorrhage in syphilitic disease of the liver, *ib.*, p. 161; in cancer of the liver, *ib.*, pp. 340 and 345, and in disease of the biliary passages, *ib.*, pp. 450 and 540.

‡ WM. A. B. NORCOM—*Hæmorrhagic Malarial Fever*, Raleigh, N. C., 1874, p. 10. Compare W. C. MACLEAN, Art. *Malarial Fevers*, [in Reynold's System of Medicine, Vol. I, London, 1866, p. 72.] "I have seen two cases at Madras, both in officers of the Forest Conservancy department, in which the hæmorrhagic range was most extensive, the patients passing blood from the stomach, bowels, and kidneys."

latter cases a part at least of the extravasated blood may be discharged by stool.* According to Aitken, the inhalation of sulphuretted hydrogen gas may give rise to hæmorrhage from the bowels.†

When the blood discharged proceeds from any point above the pylorus, and even when its source is in the small intestine, it is very frequently much altered in appearance by the influence of the gastric or intestinal contents, the red corpuscles becoming variously deformed, and the fluid when passed being black, brown or greenish, often tar-like in color and consistency, so that, indeed, sometimes it would hardly be suspected to be blood from its appearance to the naked eye, although on microscopical examination the recognition of vast numbers of altered red corpuscles leaves no doubt on the subject. These discharges of altered blood from the bowels have, since the publication of the Nosology of Sauvages, been very generally designated Melæna, a term which, in the Hippocratic writings, is applied to a disease characterized by vomiting of black matters.‡ It may be added that bloody stools of all kinds were included in these writings under the designation of dysentery, while Galen clearly separated those connected with true dysentery from those arising from other causes, attributing the former to ulceration of the bowels, and the latter to plethora, disease of the liver, or the action of black bile.§

In dysentery the source of the hæmorrhage is, most generally, some part of the large intestine, and the blood, unless present in very small quantities, is usually recognized with the naked eye by its red color. Very often, however, the proportion of pure blood that is present is comparatively small, and it is diluted by a comparatively copious transudation of an albuminous fluid, so that the fluid passed may be correctly described as bloody serum. It sometimes appears at the commencement of the disease in the form of watery discharges containing comparatively little albumen, but as the disease progresses the quantity is usually smaller and the percentage of albumen larger. This bloody serum

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* Thus C. Ph. FALCK—*Virchow's Handbuch der Spec. Path. und Therapie*, Bd. II, Abth. 1, [Erlangen, 1855,] S. 302—says that habitual drinkers suffer "sometimes from chronic diarrhœa, sometimes obstinate constipation, sometimes even from melæna." Surgeon BASIL NORRIS, U. S. Army, has recently communicated to the editor two interesting cases of intestinal hæmorrhage in spirit-drinkers. In the first there was cirrhosis of the liver with occasional bloody stools, and death. In the second, after blood had made its appearance for several days in the stools, there was a sudden and profuse hæmorrhage from the stomach, with copious vomiting of blood. This was checked by the administration of dry persulphate of iron in gelatine capsules.

† "Also from the effects of *sulphuretted hydrogen gas*—a cause of epidemic hæmorrhage from the bowels among the workmen in the mines of Anzin." AITKEN—*Science and Practice of Medicine*, Am. Ed., Philada., 1872, Vol. II, p. 663. I suppose the author to refer to the epidemic described by HALLÉ—"*Obs. sommaires sur une maladie qu'on peut nommer Anæmie, qui a attaqué tous les ouvriers d'une galerie dans une mine d'Anthracite ou charbon de terre, en exploitation à Anzain*," &c., Journ. de Méd. Chir. Pharm., &c., Tome IX, Paris, An. XIII, (1805,) pp. 1, 71, 128. See also Art. *Anémie*, in Dict. des Sci. Méd., Tome II, Paris, 1812, p. 81. But in this description, although black and green stools are mentioned, I do not find that the presence of blood was established or even suggested. OZANAM—*Maladies Épidémiques*, 2me Éd., Paris, 1835, Tome IV, p. 169—describes, also under the name of Anémie, a similar epidemic which occurred among the laborers in the mines of Schemnitz, in Hungary, in 1777–8 and 1785–92. The symptoms were quite like those of the Anzain epidemic, except that "the stools were infrequent (rares,) hard, and coated with an oily-looking substance, (d'une vernis huileux.")

‡ The Hippocratic Treatise *De Morbis*, Lib. II, [Ed. Littré, VII, p. 110,] describes, under the designation Black disease, (Μέλαινα νοῦσος,) an affection in which black matters sometimes exhaling an odor of blood are vomited. Elsewhere in the Hippocratic writings black stools are spoken of, as in *Aphorisms*, Sect. IV, 21 and 25, [Ed. Littré, IV, p. 509,] "stools black like blood." See also *Prorrhetics*, Lib. I, § 85 and 140, [Ed. Littré, V, pp. 533 and 561,] and *Prenotions of Cos*, Sect. II, § 268 and 313; Sect. VII, § 601, 621 and 624, [Ed. Littré, V, pp. 643, 653, 725 and 729.] GALEN explained the Black disease of HIPPOCRATES as originating from black bile—*Linguarum seu Dictionum Exoletarum Hippocratis Explicatio*, [Ed. Kühn, XIX, p. 120,]—and stated that the stools called black by the ancient physicians are not necessarily so from black bile, but often from blood. Compare his *Comm. IV in Hippoc. Aph.* 21 and 23, [Ed. Kühn, XVII, B, p. 681 *et seq.*,] and *De Atra Bile*, Cap. VI, [Ed. Kühn, V, p. 126.] The morbus niger of HIPPOCRATES gave rise during the 18th century to considerable discussion. See, for example, FRID. HOFFMANN—*Diss. De Morbo Nigro*, (originally a thesis of J. C. HERTIUS, Halle, 1701,) in Opera, Suppl. II, Pars 2, Geneva 1753, p. 103, and R. JAMES—*Med. Dict.*, Vol. II, London, 1745—Articles, *Melæna Nusos* and *Morbus Niger*. MERAT—Art. *Mélæna*, in Dict. des Sci. Méd., Tome XXXII, Paris, 1819, p. 191—gives a list of dissertations, with the title "de morbo nigro," by LAUSDEN, 1694; FAUSIUS, 1657; GASSER, 1761; SCHRADER, 1764; SCHONINGH, 1768; SINGER, 1775; HARTMANN, 1786; GIRARD, 1789; HOHN, 1796, and KUHN, 1802. Of these I have only obtained access to those by GASSER and HOHN. Under the head of "Maladie noire," VARNIER—*Jour. de Méd.*, (Feb. 1757,) T. VI, p. 83—described several cases of extreme prostration accompanied by fœtid and black stools. A similar case was published under the same title by VANDERMONDE—*op. cit.*, (May, 1757,) p. 336. Other cases were published by BONTÉ—*op. cit.*, (March, 1758,) T. VIII, p. 222—whose Obs. IV suggested to him the opinion that the disease was of a scorbutic nature. In the same journal GEOFFROY—T. VIII, p. 244—describes a case in which there was both vomiting and purging of "une matière noire comme de l'encre." SAUVAGES—*Nos. Meth.*, Amsterdam, 1768, T. II, p. 232—gave the following definition of Melæna: "Est alvi fluxus materiei nigricantis, atro rubræ, dejectione, aut vomitione frequenti notatus," and makes seven species, viz: 1, m. splenetica; 2, m. scorbutica; 3, m. atrabilis; 4, m. hæmorrhagica; 5, m. prima, which is the black disease of HIPPOCRATES, whose description he quotes; 6, m. febricosa, and 7, m. hepatirrhoica. SAUVAGES particularly praises the paper of VARNIER cited above. Since the time of SAUVAGES the use of the term Melæna has been more and more limited to the stools.

§ See note to p. 336, *supra*.

is passed mingled with mucus, muco-pus or pus, or, after necrosis of the diphtheritic deposit occurs in diphtheritic dysentery, with shreds of pseudomembrane or of necrosed mucous membrane, and sometimes constitutes an important part of the discharges.

According to Oesterlen,* the mean daily loss of albuminates by stool during the first fourteen days of a dysentery of moderate intensity is from 50 to 60 grammes; the total quantity of matters passed by stool ranging from 1,500 to 2,000 cubic centimetres daily. During the next eight days the daily discharges by stool range from 800 to 1,000 cubic centimetres containing, on an average, 20 grammes of albuminates. So that he estimates the total loss by stool during such a dysentery of three weeks' duration at 30,000 cubic centimetres, containing 900 to 1,000 grammes of albumen. Niemeyer has pointed out that large quantities of albumen may be precipitated by nitric acid, in the matters filtered from the dysenteric stools, even when the dejections have scarcely a reddish tinge, and when only solitary red corpuscles are found under the microscope.† The albumen, therefore, is not merely derived from the blood mixed with the stools, but a true transudation of blood-plasma takes place, and may be so considerable as to contribute largely to the production of the dysenteric collapse, as happens still more strikingly in Asiatic cholera. Partly in consequence of this transudation of blood-plasma, but partly, also, no doubt, in consequence of semi-putrid metamorphoses of the intestinal contents accompanied by the liberation of ammoniacal compounds, the dysenteric stools are usually alkaline. According to Bamberger,‡ carbonate of ammonia is frequently present in them.

4. *Portions of pseudomembrane and of the necrosed intestinal coats.*—The appearance in the stools of portions of pseudomembrane and fragments of the necrosed intestinal coats is characteristic of diphtheritic dysentery. It will be shown, in connection with the morbid anatomy, that in this disease the diphtheritic deposit of granular fibrin infiltrates the mucous and submucous layers of the intestines, and forms also a layer of variable thickness upon the internal surface of the bowel. Soon after its deposit, a process of necrobiosis or necrosis sets in, by which the diphtheritic layer is separated from the healthy neighboring tissue, carrying with it so much of the intestinal coats as may have had their vitality destroyed by the infiltration. Very generally, in those portions of the intestine in which the process is most intense, the sloughing involves both the mucous and submucous coats, so that the circular fibres of the intestine form the bottom of the diphtheritic ulcer; elsewhere the mucous membrane alone may be destroyed, so that the submucosa forms the bottom of the ulcers; or even in some places the degree of infiltration in the mucous membrane may not be sufficient to destroy its vitality, and the pseudomembrane on the surface alone may separate, leaving the mucous membrane but little damaged and in a condition capable of resolution.

The area affected by each of these degrees of the diphtheritic process varies with the severity of the disease. Undoubtedly there are cases so mild that no part of the mucous

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*OESTERLEN—*Zur Chemie der Ruhr*, Henle's Zeits. für Rat. Med., Bd. VII, (1849,) S. 253. The figures quoted in the text occur on S. 271–2. They are derived from the examination of the stools in four cases, two of which proved fatal. From the autopsies in the fatal cases, and the symptoms recorded in the others, it is probable that all belonged to the diphtheritic variety of dysentery. The largest daily quantity of albuminates found was 80.9 grammes, the smallest 13.5 grammes. The total quantity of material passed by stool in the twenty-four hours varied from 800 to 3,800 cubic centimetres, but this in several instances included the urine. The albumen was determined by acidulating with acetic acid and boiling, and it would appear that the stools were not previously filtered, for in the table on S. 269 and 270 the column in which the loss of albumen is entered is headed "Albumin und Epithelialgebilden." Nevertheless, making every allowance for this source of error, the results are striking enough, especially when compared with the analysis given by the author of the stools produced by administering calomel and jalap, which contained but 3·3 parts of albumen to the 1,000, and the stools of a patient suffering from typhoid fever, who passed (urine included) 1,000 cubic centimetres of fluid containing 3.9 grammes of albumen in the twenty-four hours. The author concludes that the more violent the disease the richer are the stools in albumen, and vice versa. LEHMANN—*Phys. Chem.*, Transl. of Cavendish Soc., London, 1853, Vol. II, p. 151—says that at the commencement of dysentery the intestinal discharges are poor in albumen, but that in the more advanced stages of cases of moderate violence "the fluid is extremely rich in albumen, being a true exudation of the blood-plasma."

†NIEMEYER—*Lehrbuch der Spec. Path. und Ther.*, 7te Aufl., Berlin, 1868, Bd. II, S. 752. ‡Page 401 of work cited on p. 266, *supra*.

membrane is destroyed; such cases stand on the border line between simple inflammatory and diphtheritic dysentery. More or less destruction of tissue is, however, the general rule in diphtheritic dysentery, except in those extremely intense cases in which death occurs before the diphtheritic layer begins to be thrown off. The slough may separate in fragments of almost any size. Large membranous pieces, from one to several inches long, or membranous tubes of more or less considerable length, are occasionally discharged;* but for the most part the fragments do not exceed a quarter to half an inch in long diameter, and still smaller morsels constitute the usual form. The most common variety of the diphtheritic stool is composed of bloody serum with numbers of these smaller morsels floating in it; they are generally soft, yellowish or reddish, and have been compared to raw minced meat.

When examined microscopically these fragments may prove to consist of the superficial pseudomembrane only, in which case they are composed of granular or indistinctly fibrillated fibrin, through which pus or blood corpuscles may be scattered or aggregated at intervals into heaps; or they may be true diphtheritic sloughs, in which case the glands of Lieberkühn and other characteristic structural elements belonging to the mucous membrane or the submucosa can often be recognized if proper methods of investigation are employed. These elements are generally more or less obscured by the granular character of the diphtheritic material with which they are infiltrated, and by the decomposition which occurred in the sloughs before they were thrown off; and the latter process may even have proceeded to such a degree that nothing can be recognized with the microscope but a granular decomposing mass, even when they are really composed of necrosed mucous membrane. Certainly, at least, portions of membrane having these characters in one part, while in others the elements of the intestinal tissues can be more or less distinctly recognized, are often found in the stools, and a similar continuity may be observed during autopsies in fragments which still adhere to the edges of diphtheritic ulcers. It may freely be admitted that not only in diphtheritic dysenteries of moderate intensity, but even in more severe cases in which sloughing of the mucous membrane is proceeding with great rapidity, many of the morsels found in the stools will prove to consist only of pseudomembrane from the most superficial portion of the deposit, or of granular masses in which all evidences of definite structure have been destroyed by decomposition; yet, it is nevertheless true that even in the milder cases of the diphtheritic form, the observer does not usually examine half a dozen well-selected fragments microscopically without finding one or more in which the anatomical elements belonging to the mucous membrane or submucosa can be plainly recognized in the midst of the granular debris.

Less frequent than this common variety of the diphtheritic stool is the so-called gangrenous stool, in which the necrosed fragments of mucous membrane are larger, often of a greenish or blackish color, and floating in a brownish or blackish slimy fluid of an extremely putrid odor. Various intermediate forms occur between this and the variety first described; the character of the necrosed fragments varying considerably, in accordance with the variations in the morbid process which will be sketched in connection with the pathological anatomy of the disease.

The shreds and fragments of membrane which occur in the stools of diphtheritic dysentery did not fail to arrest the attention of medical men even in the earliest times; they were

* *Vide infra*, p. 362.

mentioned by Hippocrates and Celsus,* and their origin was correctly explained by Aretæus and Galen,† whose views were repeated more or less exactly by almost all the subsequent writers on dysentery until the commencement of the seventeenth century, when Felix Plater ‡ expressed doubts as to the frequency of the appearance of such fragments of the intestinal coats in the dysenteric stools, and Sennertus in an elaborate dissertation § not only enforced the same view with considerable ingenuity, but suggested that when membranous fragments do occur in the dysenteric stools they probably consist only of inspissated mucus shaped in the intestines.

Morgagni in his great work ‖ adopted this view in part only, correctly held, that in some cases the fragments of membrane discharged are portions of the intestinal coats, while in others they are merely false membranes, and supported this opinion by referring to the condition of the intestinal mucous membrane observed after death in such cases. It would seem that his explanation of the second of these two possibilities made a greater impression

* HIPPOCRATES, *Aphorisms*, IV, 26, [Ed. Littré, IV, p. 511;] "If in a person ill of dysentery substances resembling flesh [ὁκοῖαι σάρκες] be discharged from the bowels, it is a mortal symptom." In the treatise on *Prognostics*, §. II, [Ed. Littré, II, p. 137] the statement is made that stools "of varying characters indicate greater duration of the complaint, but are no less dangerous; such as those which resemble scrapings, [ξυσματώδεα, in the Latin version translated "strigmentosa," Ed. Kühn, I, p. 100,] those which are bilious, those resembling leeks, and the black; these being sometimes passed together, and sometimes singly." The same statement, in almost the same language, will be found in the *Prænotions of Cos*, § 621, [Ed. Littré, V, p. 729, Ed. Kühn, I, p. 344;] the same word is used for the substances resembling scrapings in this passage as in the last, viz: ξυσματώδες in the Greek text, strigmentosa in the Latin version. See also *Prorrhetics*, Lib. II, § 22, [Ed. Littré, IX, p. 51,] where, after stating that fever, varied stools, inflammation of the liver, hypochondrium or stomach, pain, loss of appetite and thirst are bad symptoms in dysentery, that the patient who has most of these symptoms will die most surely, while he who has fewest will have the best chance of recovery, it is asserted that those who have none of these evil symptoms, even though they pass blood and ξύσματα, may yet get well on the 7th, 14th, 20th or 40th days, or within these periods. CELSUS followed HIPPOCRATES in speaking of fleshy matters as being passed in dysentery: "Interdum simul quædam carnosa descendunt," Lib. IV, Cap. 15, [Leyden Ed., 1785, p. 179.] In Lib. II, Cap. 6, [*op. cit.*, pp. 43–4,] CELSUS paraphrases the passage just quoted from the Prognostics of HIPPOCRATES thus: "Alvus quoque varia, pestifera est, quæ strigmentum, sanguinem, bilem, viride aliquid, modo diversis temporibus, modo simul, et in mistura quadam, discreta tamen repræsentat." In Lib. II, Cap. 8, [*op. cit.*, p. 55,] he remarks that a dysentery is not dangerous even if blood and strigmenta are passed, ("si sanguis et strigmenta descendunt,") so long as fever and the other severe symptoms are absent, which is evidently borrowed from the passage in the Prorrhetics cited above.

† ARETÆUS—*De Causis et Signis Morb. Diut.*, Lib. II, Cap. 9, [Ed. Boerhaave, p. 60,]—in the detailed account he gives of the dysenteric stools, states that when the lower bowels are ulcerated, matters resembling flesh (σαρκοειδέα) and shreds (ξυσματώδες) as it were of the intestines are found in the stools. From ulcers of the cæcum large red pieces of flesh are discharged. If the ulcers in the lower bowel grow worse, it sometimes happens that a long piece may come away "resembling the sound intestine." He explains that the bowels have two coats, that it is only the inner one which comes away, that subsequently the external coat which remains intact may granulate and cicatrize. This he says happens only in ulcers of the lower bowel. GALEN mentions in various places the occurrence in the stools of scrapings of the intestines, (ξύσματα.) See, particularly, the detailed description in *De Locis Affect.*, Lib. VI, Cap. 2, [Ed. Kühn, VIII, p. 382 *et seq.*] In the same place also he speaks of the passage of scabs of ulcers. (ἐσχάραι.) GORRÆUS—*Def. Med.*, [in Opera, Paris, 1622, p. 230,]—says of the word epheliis, used in this passage, that it is applicable to external as well as to internal ulcers, and cites as examples "the scabs (erustulæ) coughed up from the lungs, and those passed by stool from the intestines." DAREMBERG—*Œuvres de Galien*, T. II, Paris, 1856, p. 668—translates it "une fausse membrane." Note also GALEN'S *Comm. in Hippoc. Aph.* IV, 26, [Ed. Kühn, XVII, B, p. 691,] in which he explains that the ξύσματα are derived from the internal membranous surface of the intestines, which he compares to the cuticle of the skin, while the fleshy matters mentioned by HIPPOCRATES are portions of the very substance of the intestines, and says that when large pieces of this kind are passed the disease is fatal, because the reparative powers are not adequate to replace the tissue removed. Compare further *De Loc. Affect.*, Lib. I, Cap. I, [Ed. Kühn, VIII, p. 6,] *Comm. IV in Hippoc. de Artic.*, § 30, [*op. cit.*, XVIII, A, 730] and *Comm. III in Hippoc. de Acut. Morb. Victu.*, § 30, [*op. cit.*, XV, 686.] CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 6, [Ed. Amman, 1709, p. 525,]—speaks of the passage of ramenta, fleshy matters (carnosa) and membranes of considerable length. The two former figure in the descriptions of the dejecta given by ALEXANDER of TRALLES, Lib. VIII, Cap. 2. The word ξύσματα, variously translated as strigmenta and ramenta, which occurs in these and similar passages, originally designated matters rubbed off from the skin, as in the bath and during gymnastic exercises. These skin impurities were sometimes used for medicinal purposes both externally and internally. See R. JAMES, Art. *Strigmentum*, Med. Dict., Vol. III, London, 1745. FERNELIUS, HILDANUS (*loc. cit.*, *supra*, p. 345, note §) and many other writers of the sixteenth century and the beginning of the seventeenth, repeated the statements of GALEN with regard to this subject with but little modification.

‡ FELIX PLATER—*loc. cit.* in note to p. 347, *supra*. His language is: "Nonnullis pro ramentis intestinorum accipitur, quæ tamen si prodeant, quod rarum, ea membranea esse necesse est."

§ SENNERTUS—*Pract. Med.*, Lib. III, Pars 2, Sect. 2, Cap. 7, Quæst. 3: "An pinguedo et ramenta intestinorum tanta, ut vulgo fertur, in dysenteria excernantur?" The author refers to the case observed by MEICHSNERUS, which will be found in SCHENCKIUS—*Obs. Med. Rar.*, Frankfort, 1609, p. 389, Lib. III, De Dysenteria. Curatio, Obs. 4—of a man suffering from dysentery who often passed ramenta and membranes of the intestines a span long, and yet recovered, and to a similar observation attributed to HERCULES SAXONIA, *Pantheon*, Lib. III, Cap. 23, in which a membrane an ell long (') was passed, and yet the patient recovered. He expresses great doubt as to the accuracy of such observations, saying that he had never seen such membranes or ramenta in the dysenteric stools himself, or found among dysenteric patients or their attendants any one who had; if membranes are ever passed they must consist of an altered mucous concretion shaped in the intestines. SENNERTUS, in support of his view, speaks of J. CRATO, *Consil.* 201, as having, before PLATER, looked in vain for ramenta in a case of dysentery; but on examining this article I find that CRATO—*Consil. Med.*, collected by L. Scholz, Frankfort, 1598, p. 579—merely states, in regard to a case which he reports, that the other symptoms led him to regard it as one of dysentery, although the stools were not like those usually seen in dysentery, and no ramenta were observed.

‖ MORGAGNI—*De Sedibus et Causis Morborum*, Epist. XXXI, § 19 *et seq.*—cites from SENNERTUS the observation of MEICHSNERUS and SAXONIA referred to in the last note, and points out that the latter observation is probably not correctly reported, as SAXONIA in a subsequent work had made complaints about the publisher of the Pantheon, and in his *Prælect. Pract.*, Pars 2, Cap. 19, [in Opera Pract. Padua, 1658, p. 177] does not mention the case, although he states that he had seen four dysenteric patients in whom portions of intestine exceeding three or four fingers in measure were passed, and that of these two recovered. Besides these cases, MORGAGNI cites others of various kinds by TULPIUS, LANCISI'S, &c., some of which will be referred to in a subsequent note, and gives at length the case of a certain Jew, observed by himself, who at the decline of a malignant fever passed per anum a thick membrane, which he saw hanging out from his anus, six fingers' breadth in length, which subsequently separated spontaneously, and the patient recovered. The conclusion cited in the text will be found clearly stated at the commencement of § 20.

upon his immediate successors than his lucid account of the first, for medical opinion was soon carried to the extreme of believing that ulceration of the intestine is very rare in dysentery,* an opinion which has gradually been corrected by the progress of pathological anatomy during the present century. Especially during the last thirty years, by the use of the compound microscope in the investigation of the dysenteric stools and of the intestinal mucous membrane in fatal cases, has it been shown beyond further doubt that the double explanation of Morgagni was correct, and that the ancients were right after all in teaching that in severe cases of dysentery portions of the inner coats of the intestine separate by sloughing, though it must be confessed that they appear to have applied this explanation erroneously to fragments of pseudomembrane in the stools as well as to genuine sloughs.†

Whatever doubts may be felt at the present time as to the exact nature of the large membranes discharged in individual cases, as for example those of Tulpius, Apinus and others,‡ recorded before the introduction of the modern exact methods for determining the character of membranes passed by stool, it must be admitted that similar cases have been observed during the last thirty years as to which no such doubts are warranted. The case of Tulpius finds a parallel in those investigated by Dickson, the accurate Jeffries Wyman and other recent physicians,§ whose ability to decide the nature of the substance under consideration

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* Compare STOLL, *loc. cit.*, in note to p. 342, and FOURNIER et VAIDY, Art. *Dysenterie* in Dict. des Sci. Méd., T. X, Paris, 1814, p. 319.

† The Greek physicians made use of the varying characters of these sloughs in their attempts to distinguish, in cases of dysentery, whether the small intestine was ulcerated or the large. They attached great importance to this question, for if the large intestine were ulcerated they hoped to reach the seat of the disease by injections, while if the small intestine were ulcerated this could only be done by medicines given by the mouth. GALEN, *De Loc. Affect.*, Lib. VI, Cap. 2, [Ed. Kühn, VIII, p. 383;] ALEXANDER of TRALLES, Lib. VIII, Cap. 9, [Basel Ed., 1556, p. 454.] The characters on which they relied to make this distinction were: 1. The appearances presented by the shreds and membranes passed. The small intestine being thin and delicate, while the large intestine is thick and fleshy, fleshy, thick pieces could only be discharged when the latter was ulcerated. Thin, delicate shreds or scrapings might come from the large intestine, but in that case they would not be thoroughly mixed up with the discharges as they would be if they came from the small intestine. ARETÆUS, ARCHIGENES, GALEN, ALEXANDER of TRALLES. 2. In like manner the blood in the stools would be black and otherwise altered if it came from the small intestine; bright and pure if it came from the large. In the first case it would be intimately mixed up with the discharges; in the latter case it would float on the surface, or be only imperfectly mixed. ARCHIGENES, GALEN. 3. Discharges proceeding from the small intestine would be thin and bilious; those from the large would be thicker and often contain hard lumps of condensed fæcal matter, or would be watery and devoid of smell. ARETÆUS, ARCHIGENES, CÆLIUS AURELIANUS. 4. If the ulceration were seated in the small intestine the pain would be in the region of the umbilicus or above it; if it were seated in the large intestine the pain would be lower down. ARCHIGENES, CÆLIUS AURELIANUS. 5. If the ulceration were in the small intestine some time would elapse before the griping pain was followed by a stool; if it were in the large intestine the pain would be promptly followed by the stool. Moreover, a pain in the small intestine is more acute; that in the large intestine is dull. ALEX. of TRALLES. Some of the Greek physicians went so far as to attempt to discriminate between the ulcerations of the several parts of the small and large intestines, and gave symptoms which they supposed to show whether the ulceration was seated in the jejunum, or lower down in the small intestine, (ileum,) in the colon or the rectum. ARETÆUS, ARCHIGENES, ALEX. of TRALLES. These efforts recall more modern attempts in the same direction. See p. 270, *supra*. On the subject of this note consult, besides the passages cited from GALEN and ALEXANDER of TRALLES, ARETÆUS, *De Causis et Signis Morb. Diut.*, Lib. II, Cap. 9, [Boerhaave's Ed., p. 60;] ARCHIGENES, in ÆTIUS, Tetrab. III, Serm. 1, Cap. 43, [Lyons Ed., 1549, p. 599,] and CÆLIUS AURELIANUS, *Morb. Chron.*, Lib. IV, Cap. 6, [Amman's Ed., p. 524.]

‡ NICOLAUS TULPIUS—*Obs. Med.*, Lib. III, Obs. 17, [Amsterdam, 1652, p. 214]—relates the case of a man suffering from a violent dysentery who passed by stool the entire mucous membrane of the rectum, which hung out from the anus for two days before it was removed by the attendant. The patient recovered. J. L. APINUS—*De Abscessu Tunicæ Intest. Glandulosæ*, Ephem. Nat. Cur., Dec. III, ann. IX *et* X, (1704–5,) p. 315—relates the case of a soldier 49 years old who, after the premonitory symptoms of continued fever, had a dysenteric attack, with blood and pus in the stools, and passed several tubular substances, one of them a span long, which, after careful examination, the author concluded were portions of the villous coat of the intestine. Here too belongs, I think, the case reported by MOLINELLI—*Comm. Bonon. Scient. Acad.*, II, p. 1, *Medica*, *Obs.*, II, p. 158, [I cite from THOMSON.]—The patient, who had suffered first from griping pains and afterwards from dysentery, passed a substance "not unlike the fungous flesh of ulcers; it was more than a span in length; hollow, and open at the one extremity, but shut at the other. In its cavity, besides some blackish and dry feces, there were contained some calculi, not very numerous, resembling grains of wheat in size, figure, and colour." The patient appears to have recovered. These cases have, as I must think without sufficient reason, been regarded by THOMSON—*Abstract of Cases in which Pseudo-membranous Substances have been discharged from the Bowels*, Edinburgh Med. and Surg. Journal, Vol. 46, (1836,) p. 102 *et seq*, [see note † to p. 365, *infra*.]—as examples of the passage of mere pseudomembranes. It would be fruitless now to discuss this question at length, since the methods of precise investigation which are at present at our disposal did not exist when these cases were recorded. But since parallel cases of modern date can be found, as to the nature of which there can be no doubt, I see no reason to accept THOMSON'S view.

§ The case of TULPIUS has its parallel in the following: *Trans. of Path. Soc. of London*, Vol. III, (1850–51,) p. 370: 28—*A portion of the Rectum which, having protruded, had been cut off.* "The person on whom this operation had been performed, had suffered severely from intermittent fever, and was much debilitated from its effects. Whilst a convalescent, he was attacked with acute dysentery: and, during the efforts to relieve the bowels, a prolapse of the rectum occurred, when, experiencing insuperable difficulty in its reduction, he requested a non-professional friend who had called upon him, to be 'so obliging as to cut it off.' This request was complied with, to the satisfaction and present relief of the sufferer. The bowel removed when examined subsequently, was found to have been cut off by an irregular and oblique incision, so that it was of the extent of three inches on one side, and but an inch and a quarter on the other. On a close examination, it was found that the specimen was composed of all the tissues of the gut. Urgent symptoms set in on the second day after the removal, when more of the rectum was extruded, and subsequently removed by operation, in consequence of the impossibility of treating it by any other method. The patient subsequently recovered." Dr. BEITH, for Mr. DICKSON, 18th of November, 1851. *Descriptive Catalogue of the Warren Anat. Museum*, J. B. S. JACKSON, Boston, 1870, p. 468: "A portion of intestine that protruded from the

cannot justly be questioned; and the almost forgotten statement of Hillary* in 1759, that sometimes portions of mucous membrane several inches long were found in the stools of dysenteric patients in the West Indies, seems probable enough in view of the careful observations of Chuckerbutty,† made at Calcutta during 1864–5, with the advantage of all the modern appliances for such examinations. A striking example of the other possibility, the passage of large fragments of the diphtheritic layer alone, will be found in case 861, in Section III of this chapter.‡ In that case the cast, which was tubular in form, and "composed of pseudomembranous lymph in which no traces of the structure of the mucous membrane could be detected," was fourteen inches long. The specimen is still preserved at the Army Medical Museum.

In this connection it will be of interest to allude briefly to a form of diarrhœa characterized by the appearance in the stools of membranous substances, which sometimes even take the form of simple or branching tubes; a disease which has attracted considerable attention, and been described under various names, such as tubular looseness, or diarrhœa tubularis; chronic pseudomembranous gastro-enteritis; follicular, duodenal and colonic dyspepsia; fibrinous diarrhœa; chronic pellicular inflammation of the intestinal mucous membrane; chronic croup of the intestines; mucous disease of the colon; chronic muco-colitis; mucous disease, and membranous enteritis.§ Of these various appellatives, tubular

anus, after much straining, on the sixteenth day of dysentery, and was cut off with a pair of scissors; a few drops of blood only following the incision. The patient, aet. six months, had prolapsus daily for the first six days, and occasionally afterward, but in the course of three months was quite well. The specimen is about four inches in length; and was found by Dr. J. WYMAN to consist of mucous membrane, vessels, and areolar tissue. He also found what he supposed to be circular muscular fibres under the microscope; and in the preparation he has passed bristles into an artery, and a vein. It was stated that, two or three days after the removal of this portion, a second was expelled by the natural efforts, about an inch in length. 1855." Here too belong the cases reported by CATTELOUP—*Obs. de Dysenterie Aigue avec détachement de la membrane muqueuse du gros intestin*, Recueil de Mémoires de Méd., &c., T. 57, (1844,) p. 66—who found adhering to the internal surface of the sigmoid flexure in one soldier dead of dysentery a cylindrical membrane about 32 centimetres long, while in the transverse colon of another he found a ribbon-like slough resembling a false membrane 35 centimetres long and 55 millimetres wide. These pieces were submitted to Inspector BÉGIN, who carried them to the museum at Val-de-Grâce, where they were examined microscopically by Prof. LACAUCHIE, who found that they contained the proper tissues of the mucous membrane of the colon, and hence were not mere pseudomembranes. Consult also the well-considered remarks of ALG. HASPEL—*Maladies de l'Algérie*, T. II, Paris, 1852, p. 77—under the heading "Détachement de la muqueuse," who has himself made similar observations. To these may be added the case reported by L. FROMONT—*Des Gangrènes du Tube Intestinal*, Ann. de la Soc. de Méd. de Gand, (1858,) T. 36, p. 169—of a soldier who, while suffering from facial erysipelas, was attacked by dysentery, and, in the very offensive stools, passed a number of fragments of mucous membrane, the largest being tubular, between 40 and 45 centimetres long with walls 2 millimetres thick. On the autopsy, a curious malformation of the colon (figured in three plates) was observed at the splenic curvature. At that point there was a pouch resembling the cæcum in form, from which the descending colon originated by two separate tubes. From this point down to the sphincter ani it was found that the mucous membrane of the colon was entirely missing.

* WILLIAM HILLARY—*Obs. on the Changes of the Air and the Concomitant Epidemical Diseases in the Island of Barbadoes, and a Treatise on the Diseases of the West India Islands*, &c., (1759,) 2d Ed., London, 1766, p. 216.

† S. G. CHUCKERBUTTY—*Cases Illustrative of the Pathology of Dysentery, with Remarks*, Indian Annals of Med. Sci., No. XIX, 1865, p. 90. This paper contains 41 cases in which the stools were critically examined, and 38 post mortem examinations. Sloughs of mucous membrane were observed in the stools in a number of cases; the largest in case 8, p. 95; one about 5 inches long by 2½ broad, a second 3 inches long by 1 broad, and a third 4 inches long by 2 broad. In case 40, three dark sloughs were passed in one day, the largest 4 inches long, the others 1½ inch each. Both in cases in which sloughs had been observed in the stools, and in some in which they had not, sloughs were observed after death still adhering to the mucous membrane. The practical method of conducting the examination of the stools, on p. 152, is worthy of commendation. Consult also, in this connection, the cases and autopsies reported by CHARLES MORHEAD—*Clinical Researches on Disease in India*, 2d Ed., London, 1860, p. 258—under the head of "The separation of parts of the mucous coat in shreds and tubular portions." He states that eight cases, in which tubular sloughs several inches (the longest about one foot) in length were passed by patients laboring under dysentery, came under his own observation, and that STOVELL—Trans. Med. and Phys. Society, Bombay, N. S., No. 3, p. 29—has reported four similar cases. Of these twelve cases six died, three recovered, and in three the result was unknown. In one of the fatal cases death did not take place until three months, in another not until five months after the separation of the slough. I note the following specimen in the *Catalogue of the Museum of the Royal College of Surgeons of Edinburgh*, 1836, p. 198: "No. 1610. A large slough, apparently the inner membrane of the intestine, which came away by stool from a patient who had dysentery, and who yet recovered."

‡ *Supra*, p. 257. The specimen is No. 382, Medical Section, Army Med. Museum. I suppose the following to be a similar, though probably much smaller specimen: *Catalogue of the Anat. Museum of the Univ. of Edinburgh*, 1831, p. 72, "I, 112. Portions of the fibrine of the blood, of the shape of the cells of the colon, voided in a case of dysentery."

§ J. MASON GOOD—*The Study of Medicine*, Cl. 1, Ord. 1, Species 7, Vol. I, Philada., 1825, p. 162—"Diarrhœa tubularis, tubular looseness." ROCHE, SANSON et LENOIR—*Nouv. Éléments de Path.*, T. I, (Paris, 1841,) p. 512—"Gastro-entérite pseudo-membraneuse chronique." T. J. TODD—*Cycl. of Pract. Med.*, (Am. Reprint, Philada., 1845,) Vol. II, p. 653—"Follicular duodenal dyspepsia;" p. 663, "follicular colonic dyspepsia." JOHN GRANTHAM—*Facts and Obs. in Med. and Surg.*, (London, 1849,)—"Fibrinous diarrhœa," p. 203. J. Y. SIMPSON—*Obstet. Mem. and Contributions*, Am. Reprint, Philada., 1855, Vol. I, p. 279—"Chronic pellicular or eruptive inflammation of the intestinal mucous membrane." JOHN WILLIAMS—*Chronic Inflammation of the Intestinal Mucous Membrane, attended with Discharges of Lymph, or Chronic Croup of the Intestines*, Dublin Quarterly Journal of Med. Sci., (1864,) Vol. 38, p. 459. ANDREW CLARK (Report of Clinical Lecture by)—*Mucous Disease of the Colon*, Lancet, Dec. 17, 1859, p. 614. S. O. HABERSHON—*Functional Disease of the Colon, &c., Chronic Muco-Colitis*, Lancet, Jan. 4, 1868, p. 7. WALTER WHITEHEAD—*Mucous Disease*, The British Med. Jour., Feb., 1871, p. 143. An article which deserves censure for deficiency in proper references to authorities cited. J. M. DA COSTA—*Membranous Enteritis*, Am. Journ. of the Med. Sci., Oct., 1871, p. 321.

diarrhœa, proposed by John Mason Good, not only antedates the others, but seems least objectionable as implying no theory whatever. When the membranous substances do not present any trace of a tubular form the designation membranous diarrhœa might be used with propriety. The term membranous enteritis, proposed by Da Costa, is objectionable because it is equally applicable to diphtheritic dysentery.

Tubular diarrhœa occurs most frequently in hysterical women or hypochondriacal men, who, after suffering with nervous and dyspeptic troubles or other evidences of ill health for a variable period, become subject to attacks of colicky abdominal pains, sometimes accompanied by a hardness or tumefaction of some portion of the abdomen, and followed by the evacuation of the pseudomembranous substance, which comes away in shreds or tubes, sometimes in considerable quantity, and usually accompanied or followed by loose, feculent, watery, muco-purulent or bloody stools. The evacuation of the membranous matter is followed by relief from abdominal pain and other pressing symptoms, but very frequently this relief is only temporary, and other paroxysms ensue at variable intervals. The individual attacks generally last a week or more, and the intervals between them vary from a few weeks to several months in duration. In some of the cases reported but a single paroxysm is recorded, in others the disease appears to have been almost continuous for a considerable period of time. Of the women affected, a number were suffering at the time from some uterine disorder. A few cases are recorded as having occurred among children.*

Fernelius,† so far as I can ascertain, was the first to describe this affection. He reported two cases, one of which proved fatal, and recognized the true nature of the abnormal intestinal secretion, which he described as inspissated mucus, (*pituita concreta, pituita lenta.*) These cases were cited and commented upon by various medical writers,‡ and attention being thus directed to the subject, additional cases were observed and recorded from time to time. A number of these will be found, together with a masterly discussion of the various other kinds of membranous substances which may be passed by stool, in the thirty-first Epistle of Morgagni.§ Since his time numerous additional cases have been published, and the subject has been discussed by several able writers.‖ Among those who have

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*As, for example, one of the cases of DA COSTA [*op. cit.* in previous note] and four reported by THEODOR CLEMENS, *Ueber den Darmkrup der Kinder.*, Journ. für Kinderkrankheiten, Bd. XXXIV, (1860,) S. 30. The "Mucous Disease" of children, described by EUSTACE SMITH—*Wasting Diseases of Infants and Children*, 2d ed., (London, 1870,) p. 173—in which large quantities of mucus are passed by stool, can hardly be the same disease, since no mention is made of the passage of shreds or membranes.

†FERNELIUS—*Pathолog.*, Lib. VI, Cap. 9, [Paris, 1554, p. 181.] The first of the cases referred to in the text was that of the Embassador of Charles V. The passage of the false membrane, which was tubular, was preceded by a tumor in the abdomen. In the second case a similar tumor was noticed, but nothing was passed, and the patient died. On the autopsy the colon was found so stuffed with concreted phlegm (infarctum pituita concreta) that nothing could pass. I must confess to having been disappointed by the perusal of passages in some of the older writers which have been cited as probably referring to the morbid condition in question. Thus AUTENRIETH and UHL [*Diss. de Pseudang.*, &c., p. 14, *vide infra*] cite ARETÆUS and CÆLIUS AURELIANUS as referring to this disease, which appears to me a misinterpretation of the passages indicated. ARETÆUS—*De Causis et Signis Morb. Diut.*, Lib. II, Cap. 8—merely explains the causes of colic in accordance with the humoral pathology, saying, it "is formed from cold and thick humours, and a copious and glutinous phlegm," (Transl. of Syd. Soc., London, 1856, p. 352;) while CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 7—simply says, in describing the symptoms of colic, that if the disease grows worse "vomiting of thick humors, which the Greeks call phlegm, occurs." J. M. DA COSTA—*op. cit.*, *supra*—cites PAULUS ÆGINETA as referring to a similar disease. I have not been able to verify this statement, and a personal application to Dr. DA C. failed to elicit the desired reference. These membranes and tubes must not be confounded with Zusmata; see notes to p. 361, *supra*.

‡See, for example, SENNERTUS, *Pract. Med.*, Lib. III, Pars 2, Sect. 1, Cap. 5: "De rebus præter naturam in intestinis repertis." In this chapter, under the head of "pituita," the cases of FERNELIUS, cited in the last note, are quoted, his explanation adopted, and an additional case, that of the celebrated Lipsius, added. [See list of cases, *infra*.] I must think TODD [*loc. cit.* in note § to p. 363] altogether misrepresents SENNERTUS when he describes this disease as his third variety of colic; for in this description—*Pract. Med.*, Lib. III, Pars 2, Sect. 2, Cap. 2—under the heading, "De colica ab humoribus crassis, et viscidis in tunicis intestinorum hærentibus," the author expressly denies that phlegm, &c., adhering to the mucous surface of the intestine, could give rise to the colic under consideration, and argues that therefore an accumulation of phlegm must take place in such cases in the very substance of the intestinal coats. In this connection I may also cite VAN SWIETEN—*Comm. in H. Boerhaave Aph.*, § 719, [T. II, Leyden, 1745, p. 373.] who also cites the cases of FERNELIUS, in his article on "Diarrhœa febrilis," and speaks of the disease under discussion as one in which "glutinous concretions" are formed in the intestines and passed by stool. See also VAN SWIETEN'S article, "Morbi ex glutinoso spontaneo," § 69 *et seq.*, [*op. cit.*, T. I, p. 95.]

§MORGAGNI, Epist. 31, [see note to p. 361, *supra*.] The author shows that membranous substances may be passed either when there is dysentery or when there is not, and describes three kinds of such membranes: 1, gangrenous sloughs of the intestinal coats; 2, false membranes; 3, sloughs with false membranes adhering to them. Such of the cases cited in this epistle as belong to membranous diarrhœa will be included in the list of cases presented below.

‖See note § to p. 363, and the authors cited in the list of cases below.

systematically collected these cases, Autenrieth* and Thomson† may be particularly commended. The essay of the latter appeared in 1836, and as no similar collection of the more modern cases has been made, references to those which have been brought to my notice have been subjoined in a foot-note.‡

Clinical and microscopical examination of the membranous matters passed in tubular diarrhœa shows that they are chiefly composed of inspissated mucus, as was originally supposed by Fernelius. With this a fluid more or less albuminous in character is often mingled, but fibrin is seldom present in any considerable quantity. Dilute acetic acid does not dissolve the membranes or cause them to become swollen and transparent, while they freely dissolve

* Under the direction of H. F. AUTENRIETH, two dissertations were published in 1831, which cover the whole subject of membranous substances passed by stool. The first by J. PLATZ—*Diss. de dejectione portionis intestinorum per alvum, non semper mortifera*; the second by M. UHL—*Diss. de pseudangomorphosi in tubo intestinali*; both at Tubingen. The first of these essays contains two series of cases, viz: 1, those in which portions of the intestinal canal, including all the coats, have been passed, as in ileus and hernia; 2, cases in which the mucosa alone has separated by sloughing, especially in dysentery. In the second essay there is a collection of cases in which coagulable lymph was passed in the form of tubes, and a case in which the tubes were branched is given in detail, as to which see note * to p. 367, *infra*. It is explained that tubes of coagulable lymph may be passed: 1, in dysentery; 2, in aphthous fever, and 3, in the peculiar form of diarrhœa which J. MASON GOOD called diarrhœa tubularis.

† The dissertations of AUTENRIETH served as the basis for a still more elaborate discussion of the subject by WM. THOMSON, who in 1835–6 published two essays on the same subject—*Abstract of Cases in which a portion of the cylinder of the Intestinal Canal, comprising all its coats, has been discharged by stool, without the continuity of the canal being destroyed*, Edinburgh Med. and Surg. Journal, Vol. 44, (1835,) p. 296; *Appendix* to the same, id., Vol. 45, (1836,) p. 374, and *Abstract of Cases in which Pseudo-membranous Substances have been discharged from the Bowels*, id., Vol. 46, (1836,) p. 102. In these interesting essays THOMSON has presented almost all the cases cited by AUTENRIETH, with some additional ones, but he expresses doubts "whether there be any morbid process, by which we can suppose the mucous membrane of the intestinal tube to be detached from its other coats, in portions of considerable size, and at the same time of sufficient consistence to retain its membranous character." Accordingly the list of cases in which pseudomembranous substances have been discharged, presented in his second essay, includes those cases which AUTENRIETH had considered separately as cases in which the mucous membrane separated by sloughing. On examining critically the cases included in this list, I find 9 which belong to diphtheritic dysentery, or other diseases and accidents, so that of the 35 cases of which abstracts are given, only 25 can be regarded as belonging to the form of diarrhœa under discussion. Thus case 7, cited from MOLINELLI, and 9, from TULPIUS, [see note ‡, p. 362, *supra*,] are cases of diphtheritic dysentery. Case 10, from MORGAGNI, [see note ‖ to p. 361, *supra*,] case 11, from APINUS, [see note ‡ to p. 362, *supra*,] and case 12, from LECHEVEREL, are of more doubtful character, but certainly not cases of the disease under consideration; while of the five cited by our author (Vol. 46, pp. 105–6) under the head of "Cases of pseudo-membranous discharge in which an examination of the body has taken place subsequently to death," only that cited from ABERCROMBIE [see next note] belongs to this category. Of the four remaining cases, that by A. E. TARTRA—*Essai sur l'Empoisonnement par l'Acide Nitrique*, Paris, 1802, p. 170—is a case of corrosive poisoning which derives its interest only from analogy. That by LEFAUCHEUX—*Obs. sur un sac membraneux faisant partie de l'estomac, rendu par le vomissement*, Journ. Gén. de Méd., T. 23, (1805,) p. 349—and the first of those cited from A. N. GENDRIN—*Hist. Anat. des Inflammations*, Paris, 1826, T. I, p. 633—are cases in which the stomach, not the intestines, was involved; and the remaining case, also from GENDRIN, (*loc. cit.*,) is clearly an ordinary case of acute diphtheritic dysentery.

‡ This list makes no pretensions to be exhaustive, and includes only, whether of ancient or modern cases, those which there seems to be good reason for classing under the head of tubular or membranous diarrhœa. FERNELIUS, *Pathолog.*, Lib. VI, Cap. 9; two cases, [see note † to p. 364, *supra*.] VALENTINUS, *Obs. admiranda de ejectione membranarum sanguinolentarum per secessum formam viperæ referentium*, Venice, 1621. I quote from the notice in HALLER'S *Bibl. Med. Pract.*, T. II, p. 497. The case of the celebrated Justus Lipsius in the life of HEURNIUS, prefixed to *Heurnii Opera*, Leyden, 1658. [see SENNERTUS, *loc. cit.*, in note ‡, p. 364, *supra*.] GODFR. THOMASIUS, *De int. intest. tunicæ ejectionibus*, Ephem. Med.-Phys. German., (1696,) Dec. III, an. 3, Obs. 190, p. 319. C. BERTHOLD BEHRENS, *De membranis per anum secedentibus*, ib., an. 5 et 6, Obs. 34, p. 77. ROSINUS LENTILIUS, *Appendix ad Dec.* III, an. 3, Ephem. Med.-Phys. Germ., p. 88, *ad Obs.* 68. J. M. HOFFMANN, *De Diarrhœa cum excretione pellicularum plurimarum*, ib., Dec. III, an. 9 et 10, Obs. 60, p. 124. Case reported by BIANCIARDUS in a letter to LANCISIUS, in *Diss. de triplici intestinorum polypo*, (1710,) in Lancisi Opera, Geneva, 1718, T. II, p. 268. J. M. VERDRIES, *De pelliculis, intest. tunicæ similibus, excretis*, Ephem. Med.-Phys., (Frankfort and Leipsic, 1712,) Cent. I, Obs. 91, p. 177. J. J. TREYLING, *Vagina entero-morpha per anum excreta*, Act. Phys.-Med. Nat. Cur., T. V, 1740, p. 436, Obs. 126; this case is particularly interesting, because the imperfect microscope of the time was called into requisition, and proved adequate to show that the cast was not a portion of the walls of the colon, as was at first supposed. THOMAS SIMSON, *Separation of the villous coat of the intestines in diseases*, Edinburgh Med. Essays and Observ., Vol. V, Part 2, (1744,) p. 656. J. GOTTLIEB BAUER, *Epist. de Molis Intestinorum*, Dresden, 1747; in HALLER'S *Disp. ad Morb. Hist. et Cur.*, T. III, p. 461. L. L. FINKE, *De Morbis Biliosis Anomalis*, Monasterii Westphalorum, 1789, p. 30; one case; note his remarks on the characters of the matter passed. J. KÄMPF, *Abhandlung von einer neuen Methode, die Krankheiten im Unterleibe, etc., zu heilen*, Leipsic, 1784; Krankheitsgeschichte 43, p. 453; 46, p. 463, and 64, p. 486, (three cases.) PERCIVAL, *Memoirs of the Medical Society of London*, Vol. II, (1789,) p. 60. *Eine merkwürdige, noch dauernde Krankheit einer Dame*, Hufeland's Journal, (1799,) Bd. VIII, Stück 2, p. 3. ALEXANDER MONRO, Jr., *Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, Edinburgh, 1811, p. 120. GEO. M. BURROWS, *An Account of a peculiar substance voided by stool*, &c., London Med. Surg. and Pharm. Repository, Vol. I, 1814, p. 374. DESTRÉES, *Hist. d'une inflammation, etc.*, Jour. Gén. de Méd., T. 62, (1819,) p. 206. RICHARD POWELL, *On certain painful affections of the intestinal canal*, Trans. Coll. Phys., London, (1820,) Vol. VI, p. 106; four cases; all adult females. J. MASON GOOD, *Study of Medicine*, (1822,) Diarrhœa Tubularis, Am. Reprint, Philadelphia, 1825, Vol. I, p. 162. ABERCROMBIE, *Diseases of the Stomach*, &c., &c., Edinburgh, 1828, Case 114, p. 298. This case is interesting on account of the autopsy, in which the whole mucous membrane of the colon "was thickly covered with small spots of a clear white colour, which were remarkably distinguished by their colour from the mucous membrane surrounding them. Few of them were larger than the diameter of large pin heads, and, on minute examination, they were distinctly ascertained to be vesicles, very little elevated, but, when punctured, discharging a small quantity of clear fluid." CHRISTIAN, *Obs. de gastro-enterite couenneuse*, Recueil de Mém. de Chir., etc., Militaires, T. XXXVII, 1835, p. 297. AUTENRIETH and UHL, *Diss. de pseudangomorphosi, etc.*, cited above; a case in which the tubular membranes were branched. Abstracts of the foregoing cases, except those recorded by FINKE and CHRISTIAN, will be found in the essays of AUTENRIETH, THOMSON, or both—See note ‖, *supra*. The following cases have appeared since THOMSON'S publications: LAMBRON, one case, Bull. de la Soc. Anat. de Paris, 16me, an., (1841,) p. 268. BROCA, two cases, *ib.*, 29me, an., (1851,) p. 60. POTAIN, one case, *ib.*, 32me, an., (1857,) p. 163; during the debate on this case, AXENFELD and BLONDEAU each mentioned a case observed by himself. RICHARD QUAIN—*Diseases of the Rectum*, 2d Edit., London, 1855, p. 311—under the heading Alvine Concretions, gives two cases. HUTCHINSON—*Tubular Exudation Casts of the Intestine*, Trans. Path. Soc. of London, IX, (1857–8,) p. 188—one case. GEO. HARLEY—*Fibrinous Concretions from the Intestines*, Trans. Path. Soc. of London, XI, (1859–60,) p. 92—one case. A. LABOULBÈNE—*Recherches, etc., sur les affections pseudo-membraneuses*, Paris, 1861, p. 145—one case. VIDAL, *Érysipèle intestinal concomitant à un érysipèle de la face; évacuation de productions membraniformes et gélatiniformes, etc.*, Gazette des Hôpitaux, Nov., 1862, p. 518. WILLIAMS, (1854,) *Chronic Inflammation of the Intestinal Mucous Membrane*, &c., cited in note § to p. 363, *supra*; a case observed by Mr. O'Donovan and one by Dr.

in a solution of caustic potash. Examined with the microscope, they prove to consist of a hyaline or slightly granular matrix, which becomes fibrillated on the addition of dilute acetic acid, from the precipitation of mucin filaments. Scattered through this matrix are a variable number of cells resembling the white corpuscles of the blood, of columnar epithelial cells, and of modified forms resulting from the vacuolation and partial decomposition of these elements. Debris derived from the food adhere to the surface, or are imbedded in the substance of these membranes. For further particulars with regard to their chemical and microscopical characters the reader may advantageously consult the accounts given by Wilks and Clark, Vidal, Perroud, Beale, Da Costa and Goodhart.*

Hutton; the first of these cases has been separately published by R. W. O DONOVAN—*On plastic inflammation of the intestine*, The Dublin Hospital Gazette, Vol. I, 1854–5, p. 186. PERROUD—*Note sur les Concrétions Muqueuses Membraniformes dans les Intestins*, Mém. de la Soc. des Sci. Méd. de Lyon, (1864–5,) T. IV, p. 44—six cases. LIONEL S. BEALE—*The Microscope in its Application to Pract. Med.*, 3d Edit., London, 1867, p. 195—one case. JULES GUYOT, *Obs. d'un malade qui, après avoir présenté des symptômes paraissant devoir être rapportés à un étranglement interne, a guéri après l'expulsion par l'anus d'une grande quantité de mucosités intestinales*, L'Union Médicale, T. V, (1868,) p. 511. See also the comments on this case by H. MERLAND DE CHAILLÉ, *Note pour servir à l'histoire de l'entérite pseudo-membraneuse*, op. cit., p. 909, in which the writer makes the following somewhat remarkable statement with regard to the frequency of cases of this kind: "For myself since 1863 I have collected about thirty perfectly authentic examples, with detailed observation and preservation of some specimen-products in alcohol." A. GRISOLLE—*Traité de Path. Interne*, 9me Éd., Paris, 1869, T. II, p. 753—one case in the section "De l'entéralgie." F. SIREDEY—*Note pour servir a l'étude des concrétions muqueuses membraniformes de l'intestin*, L'Union Médicale, T. VII, (1869,) pp. 75, 86 and 101—one case. J. M. DA COSTA—*Membranous Enteritis*, Am. Jour. of the Med. Sci., Oct., 1871, p. 321—gives seven additional cases. JAS. F. GOODHART—*Casts from the intestine*, Trans. of Path. Soc. of London, XXIII, (1871–2.) p. 98—one case. B. VAN VALZAH—*Case of Membranous Enteritis*, Am. Jour. of the Med. Sci., July, 1873, p. 106. WM. M. FINDLEY—*Membranous Enteritis, with cases*, Am. Journ. of the Med. Sci., Jan., 1875, p. 103—three cases; all in females. To the foregoing cases I add, as a matter of interest, the following references to specimens which probably belong to this disease, and which I have found in such museum catalogues as I have been able to consult. *Catalogue of the Anat. Museum of the Univ. of Edinburgh*, 1831, p. 72. "f. 115—Cylindrical tubes, composed of coagulable lymph and viscid gelatinous matter, passed by stool;" "l. 116 and 117—Substances passed by stool, resembling bloodvessels with their branches; were mistaken for worms;" "l. 121 and 123—Bodies resembling arteries, passed by stool." *Catalogue of the Museum of the Royal College of Surgeons of Edinburgh*, 1836, p. 208, No. 1694—"Exudation of coagulable lymph from the mucous surface of inflamed intestine, which is sometimes erroneously considered as a portion of intestine passed by stool." *Catalog der path.-anat. Sammlung zu Giessen*, 1851, S. 20, Schrank Nr. XVIII, 58–61—"Pseudomembranöse, röhrenförmige Ausleerungen aus dem Darm." *Catalogue, Musée Vrolik*, Amsterdam, 1865, p. 394, D. Partie Path., "993, 20—Masse de pseudomembranes, formées dans l'intestin d'une femme, qui en évacuait périodiquement;" "994, 21—Masse pseudomembranense évacuée per anum par une fille." J. B. S. JACKSON—*Descriptive Catalogue of the Warren Anat. Museum*, Boston, 1870, p. 473: "2256. A portion of lymph in a tubular form, and removed after death from the intestines." From a man 34 years old, who died after a few days' sickness of meningitis. His bowels having previously been costive, he had several thin, black fœtid dejections. In the first two of these there were several portions of lymph measuring altogether about a foot in length. Under the microscope they "appeared to consist of a granular and fibroid substance, with epithelium." The mucous membrane of the last two or three feet of the ileum was found much inflamed and covered by a slight deposit of lymph. "The large intestine was also highly inflamed, with thin patches of lymph upon the surface, from one to two inches in diameter." I am not satisfied, however, that this was not a case of intercurrent dysentery. A similar disease to that we have been considering appears to exist also in the lower animals. I find in the *Catalog der path. anat. Sammlung des Coll. anat. chir. zu Braunschweig* [Braunschweig, 1854, p. 25] the following entry: Krank. des Darmcanales, etc., No. 38—"Ein 9 Fuss langes, darmförmiges Stück plastischer Lymphe einer Kuh per Anum abgegangen;" and in an interesting article on the passage of such membranes in cattle, by TH. CLEMENS—*Ueber die membranöse Darmentzündung der Kühe und deren Beziehungen zum Darmkrup der Kinder*, Journal für Kinderkrankheiten, Bd. XXXIV, (1860,) S. 180—a case related by ENGESSER, in which a cow passed a number of tube-like pseudomembranes which together measured fifteen feet in length.

* WILKS and ANDREW CLARK—*Trans. of Path. Soc. of London*, Vol. IX, (1857–8,) p. 180—examined microscopically the casts from Dr. Dunhill's case, reported by Mr. Hutchinson, (*loc. cit.*,) and made a report to which CLARK added some "supplementary notes," in which he states that he has examined numerous similar specimens chemically and microscopically with the same results. The casts proved to consist of a "gelatinous membraniform matrix, traversed by a coarse network of opaque yellow lines." This matrix was free from fibrillation, but "was fibrillated by acetic acid. Careful washing and compression, yielded a fluid abundantly coagulable by heat and nitric acid." In this matrix numerous cylindrical epithelial cells, lymphoid cells, larger spherical cells, some of them containing vacuoles and granular cells, were imbedded, together with granules, bile pigment and foreign matters derived from the food. The conclusion drawn is, that the casts in this case consisted of altered mucus and albumen, but contained no fibrin, and that they were formed in the large intestine. Dr. CLARK makes three varieties of casts of this kind: 1, consisting of mucus with but little albumen; 2, abundance of albumen and mucus; 3, the same with the addition of fibrillated fibrin. The paper is accompanied with a plate representing the appearances observed. I may mention in this connection an interesting account of the chemical examinations of some casts of this character which long antedates the above, viz: A. T. THOMSON, as reported by G. M. BURROWS, London Med. Repository, Vol. I, (1814,) p. 374, [see last note.] He examined the membranes in a case of this character both chemically and microscopically. It is not surprising that, with the microscope of that time, he found the membranes "composed of a congeries of perfectly round, opaque, beautifully polished globules;" but his chemical examination was more to the point. Among other reactions he observed that very little alteration "except that it appeared to be more firmly coagulated," was produced by acetic acid, and that it dissolved in liquor potassæ. He concluded that it "consisted chiefly of animal mucus, combined with a small portion of albumen, and gelatin," (fibrin?) VIDAL—Gazette des Hôpitaux, Nov., 1862, p. 518, [see last note,]—in a case which he examined, found the membranes composed: 1, of a concrete mucus which appeared somewhat fibrillated in some parts; 2, a great quantity of deformed epithelial cells, some of them grouped irregularly, others grouped so as to represent the orifices or pouches of the glands of Lieberkühn. He regarded the casts as a product of epithelial desquamation of the intestine. PERROUD—*Note sur les Concrétions Muqueuses Membraniformes dans les Intestins*, Mém. de la Soc. des Sci. Méd. de Lyon, (1864–5,) T. IV, p. 44—examined similar concretions in several cases with substantially the same results. He found: 1, hyaline mucus; 2, cylindrical epithelial cells and debris; 3, nuclei; 4, leucocytes; 5, crystals of the ammonio-magnesian phosphate; 6, fragments of hæmatosine and debris of the food. He found the casts completely soluble in caustic potash, partly so in aqua ammoniæ, insoluble in acetic acid or in cold nitric or hydrochloric acids, but soluble in boiling nitric acid and cold sulphuric acid. From these and other reactions he concluded that the concretions consist of mucus combined with a little albumen. LIONEL S. BEALE—*The Microscope in its Application to Pract. Med.*, 3d Edit., 1867, p. 195—examined the membranes passed in such a case, and says that they were "composed of a very firm mucus, in which numerous cells of epithelium from the large intestines were imbedded." J. M. DA COSTA—*Membranous Enteritis* [cited in last note]—substantially agrees with the foregoing, but says that in his own microscopical examinations the epithelial cells were sparingly present. He gives at length the details of the chemical examinations of several specimens by Dr. H. B. HARE, who concludes that the casts he examined "were composed, in the majority of instances, of mucus; that one or two contained a trace of albumen, and that they contained no fibrin." J. F. GOODHART—*Casts from the intestine*, Trans. Path. Soc. of London, Vol. XXIII, (1871–2,) p. 98—in connection with a case [see last note]—reported to the Patho-

It will be observed that the membranes and tubes in the stools of tubular diarrhœa differ greatly, even from those membranes and casts in the stools of diphtheritic dysentery which are composed of the diphtheritic layer alone, without any portion of the necrosed mucous membrane. The former are composed chiefly of hyaline mucus, the latter of granular fibrin. There seems to be no reason why shreds and membranes of condensed mucus should not occur in the stools of simple inflammatory dysentery, in the early stages of the diphtheritic form, or mingled with other membranes and shreds in the later stages; but in point of fact, when shreds and membranes are found in the dysenteric stools, they usually prove to consist either of necrosed tissue or of granular fibrin. Undigested fragments of food, as in lientery, may, in certain cases, simulate the membranous or even the tubular matters described above, but the difference can be detected at once by the microscope.*

5. *Bacteria and other low vegetable and animal forms.*—That innumerable swarms of micrococci and bacteria, together with a small number of torula-like forms, exist at all times in the healthy stools, and, therefore, as a matter of course abound in the discharges of diarrhœa, has already been mentioned in a previous part of this chapter.† It is not surprising, therefore, that these low forms should have been observed also in great numbers in the dysenteric stools; and since the publication of the theories of Hallier‡ they have been regarded in many quarters as the cause of the disease. This modern speculation was preceded by several similar hypotheses, according to which other minute vegetable or even animal forms were supposed to act as the efficient cause of dysentery; the earliest of these was the doctrine of animalcular contagion, which came into existence soon after the invention of the compound microscope,§ and found advocates among the best medical minds of the seventeenth and eighteenth centuries.

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logical Society, Dec. 19, 1871, gives some figures of the microscopical appearances [Plate I, Figs. 3, 4 and 5] which are very similar to those in the drawing of WILKS and CLARK, and an account of the chemical reactions which agrees in all essential points with the writers cited above. In addition to the concurrent opinions of the foregoing writers, I must mention that of ARTHUR FARRE, who read before the Microscopical Society of London, June 22, 1842, a paper "*On the minute structure of certain substances expelled from the Human Intestine, having the ordinary appearance of shreds of false membrane, but consisting entirely of confervoid filaments probably belonging to the genus Oscillatoria.*"—The Microscopical Journal and Structural Record, London, 1842, p. 189. The case appears from the symptoms to have been one of the disease under consideration; but the substance passed is described as composed of filaments of nearly uniform size and 1-7000th of an inch in diameter, most of them exhibiting cross lines like those which in Oscillatoria mark the division into cells. A similar observation was made by BROCA—Bull. de la Soc. Anat. de Paris, 29me an., (1854,) p. 60—who in connection with one of his cases speaks of having observed forms resembling the parasitic algæ seen in muguet. When the abundance of bacteria, leptothrix filaments and other low vegetable forms in the normal stools is taken into consideration, it seems somewhat singular that such forms have not figured more conspicuously in the published accounts of the microscopical appearances of these membranous stools.

* Thus, QUEKETT, the distinguished English microscopist, in a communication to RICHARD QUAIN—*Diseases of the Rectum*, 2d Edit., London, 1855, p. 318—describes the case of a woman, who at intervals of a fortnight or three weeks had paroxysms of abdominal pain, which were relieved on passing a quantity of membranous matters and tubes, the mass of which sometimes exceeded an orange in size. On microscopical examination these membranes proved to consist of flakes of areolar tissue and portions of fascia mixed with fat, while the tubes were portions of arteries and veins; the whole mass representing the undigested portions of the *mutton chops* which had constituted the meat diet of the patient. QUEKETT states that he had observed, in all, nine cases of this character, in each of which pieces of arteries were readily detected. "All the patients who voided these substances were, as far as could be ascertained, dyspeptic; and the usual meat diet prescribed by the medical attendants was mutton, in the form of chops." "The short portions of artery which preserve their tubular character when placed in fluid, have invariably been regarded by the patients themselves as joints or fragments of worms, and on this account have excited alarm." QUEKETT thinks that in the case of FARRE [last note] the membranes were of the same character, basing his opinion upon his own examination of the specimen. "Recent investigation, however, has convinced me that all the tubular portions are fragments of arteries and veins, and the membranous ones portions of fasciæ. The transverse striæ, which most of the fibres present, are either the result of cooking or of partial decomposition, as has been pointed out in the case of the yellow elastic tissue of the sheep, the horse, and the giraffe." [p. 319.] CORRIGAN—*Cases of discharge of ligamentous substance from intestines*, Dublin Hosp. Gazette, Vol. I, 1854-5, p. 38—following the directions of QUEKETT, found the membranes passed in two cases to be fragments of yellow elastic tissue, resembling, if not identical with that in the ligamentum nuchæ of the sheep. Does not the simple explanation of QUEKETT account also for the peculiar branching tubes described and figured by SCHÜBLER—*Ueber die polypösen Concremente bei der Ruhr*, (with plates,) Jahrbücher der teutschen Med. u. Chir., Von Harles, Bd III, Heft I, Nürnberg, 1813, S. 66—who observed them in the stools of several dysenteric subjects during the epidemic at Stuttgart in the summer and fall of 1811; as well as the two similar cases reported, the one also in a dysenteric subject by A. ELSÄSSER—*Einige Bemerkungen über die polypösen Concremente bei der Ruhr*, &c., same Journal, Bd. III, Heft I, S. 76—the other in a dyspeptic woman reported by M. UHL—Thesis cited in note * to p. 365, *supra*. All three authors were struck by the similarity of the branching tubes to arteries; but this simple explanation did not satisfy them; and the microscope of these days would hardly have proved adequate for the satisfactory investigation of the tubes in question, even if it had been used, which does not appear to have been the case. The figures given by SCHÜBLER and UHL certainly are most readily accounted for by adopting this view of the nature of the tubes represented. † P. 279, *supra*. ‡ See notes to p. 280, *supra*.

§ The compound microscope was probably invented by HANS JANSSEN and ZACHARIAS, his son, two spectacle-grinders of the town of Middleburg in Holland, somewhere about the year 1590. See the learned discussion of the history of the microscope by HARTING—*Das Mikroskop*, German Transl., Braunschweig, 1866, Bd. III S. 22 *et seq.* See also QUEKETT—*Practical Treatise on the use of the Microscope*, 2d Ed., London, 1852, p. 1 *et seq.*

The occurrence in a certain skin disease of an extremely minute living creature, so small that it could only be seen by sharp eyes and in a favorable light, had long been known to the common people, who were accustomed to extract the little animal by means of a needle or pin, especially from the hands and feet of the patients. The English called them *wheale-wormes*, the Germans *Süren*, the Italians *pedocelli* or *pedoscelli*, and various other names were bestowed upon them by the common people in different districts. Descriptions of this parasite and of the skin disease which it produces will be found in the writings of Avenzohar, Guy de Chauliac, Benedictus, Ingrassias, Scaliger, Ambroise Paré, Joubert, Fallopius, Mercurialis, Schenckius, Aldrovandus, Thomas Moufet and other writers from the twelfth to the seventeenth century.*

* The fact that the parasite of Itch (*Acarus scabiei*, *Sarcoptes scabiei*) is visible to the naked eye makes it probable enough that it was known to the ancients. Two passages in the writings of ARISTOTLE have been supposed to refer to it. One in which he speaks of a minute whitish animal, which he names *Acarus*, (Ἄκαρι,) found in old honey-combs and in dry wood, which he says is the least of all animals—*De Animal. Hist.*, Lib. V, Cap. 32, [Paris Ed., 1848–54, T. III, p. 102;]—and another in which he describes certain lice which are generated beneath the skin, and give rise to small vesicles which contain no pus. But even if it be granted that these passages refer to the acarus in question, it must be admitted that long after the time of ARISTOTLE the physicians remained ignorant of it. GALEN, who appears to have had the best clinical knowledge of scabies of any of the Greek physicians, and who speaks of it under the designation psora (ψώρα) as contagious—*De Diff. Feb.*, Lib. I, Cap. 3, [Ed. Kühn VII, p. 279,]—does not anywhere allude to the parasite, nor is mention of it made by any of the Greek or Roman medical writers or by any of the Arabians except AVENZOHAR. The prince of the Arabians, AVICENNA—Lib. IV, Fen. 7, Tract. 3, Cap. 6; Venice Ed. of 1595, T. II, p. 250—in writing "de scabie et pruritu," seems, however, to come very near the truth when he says: "Et causæ quidem generantes materiam scabiei sunt causæ generantes materiam pruritus, verum ipsæ sunt fortiores et appropinquant causis generantibus pediculos," &c. The first unmistakable account of the itch-acarus in any medical writing was given in the 12th century by AVENZOHAR [or EBN-ZOHR] in a chapter headed, De assoab, qui latine dicitur (dicuntur) pedoscelli, [the word pedoscelli, pedicelli or pellicelli was the vulgar Latin for syrones, cirones or acari; see ALDROVANDUS and the thesis of SCHWIEBE, cited on page 369,] in which he says: "Oritur (oriuntur) aliquando in corpore sub cuti (cute) exteriùs pediculi parvunculi, qui, cum excoriatur cutis, exeunt animalia viva tam parvuncula quod (quæ) vix possunt (possint) videri." In the treatment of this affection he recommends first purgatives, then inunction with oil of bitter almonds and other oleaginous substances—*Theisir*, i. e., *Rectificatio Medicationis et Regiminis*, Lib. II, Tract. 7, Cap. 18, Venice, 1490, fol. 32. [There is in the Surgeon General's library another black-letter edition of this work without date, in which the above is numbered Cap. 19.] I cannot agree with HEBRA—*Hautkrankheiten*, in Virchow's Handb. der Spec. Path. u. Ther., Bd. III, Abth. 1, Erlangen, 1860, S. 410; also New Sydenham Society's English Transl., Vol. II, London, 1868, p. 164—to whose learned history of scabies I refer the reader, that this chapter is not sufficient evidence that AVENZOHAR was acquainted with the itch-mite, and note that, although he gives a translation of the passage cited above, as well as the paraphrase of MOUFET, (*vide infra*,) he does not allude to the treatment recommended by the Arabian author. HEBRA, therefore, regards the two passages which he cites from the *Physika* of SAINT HILDEGARD, written in the twelfth century, [*De Plantis*, Cap. 55 and 110,] as the earliest indisputable references to the itch-mite. In that work they are spoken of as *suren* or *suern*, and the external application of two plants, *myntza major* and *bilsa*, (henbane?) is recommended to destroy them. According to HEBRA, a similar passage occurs also in the *Herbarium* of WILHELM GRALAP, [1456,] in which the *grosz myntz* and *bilsenkrut* rubbed on the parts affected are recommended to destroy süren. I have not had access to either of these works. The following passage occurs in the French version of the *Surgery* of GUY DE CHAULIAC, [1363:] "Les cyrons sont des petits animaux qui en rongeant font comme des sillons de travers entre le cuir et la chair, principalement dans les mains des paresseux"—*La Grande Chyrurgie de* MAISTRE GUY DE CHAULIAC, Bourdeaux, 1672, Traité VI, Chap. III, p. 495, *Des poux et des cirons*. He did not, however, identify this condition with itch, of which he treats in the previous section of the same chapter, *op. cit.*, p. 492. ALEXANDER BENEDICTUS—*De omnium à vertice ad plantam morborum signis, causis*, &c., Venice, 1535, Lib. XXI, Proœminm, I cite the Basel Ed. of 1549, p. 382—writes: "In manibus quidam exilis pediculus lende minor sub cute serpit, non admodum frequens in capite sub cuti pediculus infantiæ peculiare tædium." J. P. INGRASSIAS—*De Tumoribus præter naturam*, Naples, 1552, p. 351—described them as a species of lice: "Præter hanc vero pediculorum speciem alia est, sub cuticula oboriens, ibique affixa permanens, aut parum deambulans, præcipueque in manibus ac pedibus, frequentiusque in pedibus infantium, non permittens illos quiescere. Dicuntur Arabicè assoab apud Abenzoarem, à nostris vulgò pedicelli, dicunt aliqui pedoscelli. Mirum herclè dictu, quod uti perbellè Abenzoar descripsit, cum excoriatur cutis (ubi scilicet minimus ille iouthus varulusve, cujusdam sudaminis instar apparet) exeunt animalia viva, tam parvuncula, quod vix possunt videri." HEBRA (*loc. cit.*) singularly enough has no doubt that in this passage INGRASSIAS shows his knowledge of the itch-mite, although he denies that AVENZOHAR, from whom INGRASSIAS derived his information, had. JOHANNES LANGIUS is cited by SCHENCKIUS (*vide infra*) as follows: "Syrones inquit Abinzoar sunt pedicelli, Arabibus Assoalat dicti, qui subter cutem et ad manus et crura serpunt, pustulas quoque aqua plenas, sub cute, ubi delitescunt, excitant, qua dissecta, prorepunt animalcula tam parva, ut vix visu quantumvis perspicaci aegre deprehendi possint. De quibus *Arist.* videtur *in libro de natura animalium* ita dixisse: pediculi ex carne gignuntur, quibus affuturis, emergunt pustulæ quædam sine pure exiguæ, quas si purgas, pediculi exeunt valde exiles." An elaborate article on the subject of this parasite will be found in the curious work of J. C. SCALIGER—*Exotericarium Exercit. Lib. XV, de Subtilitate ad H. Cardanum*, Exerc. 191, § 7, Paris, 1557; I cite the Frankfort Ed. of 1592, p. 631—who gives the following synonyms: "acaris, garapates, pedicellus, scirus, brigans, ricinus, croton, eica, cynoraistes, plata, cæca, cioy," and remarks: "Vix oculis capitur magnitudo. Tam pusillum est, ut non atomis constare, sed ipsum esse una ex Epicuri atomis videatur. Ita sub cute habitat, ut actis cuniculis urat. Extractus acu, super ungue positus, ita demum sese movet, si solis calore adjuvetur. Altero ungue pressus haud sine sono crepat, aqueum que virus reddit." The extraction of the parasite on the point of a needle, referred to by SCALIGER in this passage, was known to the common people. It is alluded to by AMBROISE PARÉ—1575, Lib. 22, Chap. 6: I cite MALGAIGNE'S Ed., Paris, T. III, 1841, p. 270—who recommended this practice in the treatment. "Les cirons se doivent tirer avec espingles ou aiguilles: toutesfois il vaut mieux les tuer avec onguens et decoctions faites de choses ameres et salées." JOUBERT mentions that some of the common people had the knack of extracting them, but regards this practice as ineffectual to cure the disease: "Cyrones peculiariter vulgus acicula extrahit (Germani vocant Seuren graben) sed cum non simul tollatur causa eorum fomes, perseverat affectio. Itaque præstat unguento vel fotu eos extinguere, quo simul tollatur pruritus ille infestissimus." [I cite from SCHENCKIUS, *loc. cit.*, *infra*.] FALLOPIUS—*Opera*, T. II, Tract. 1, *De Ulceribus*, Cap. 26, 1577; I cite the Venice Ed. of 1606, T. II, p. 90—taught that the irritation produced by this parasite constitutes one of the varieties of scabies. The chapter referred to is headed, "De scabiei variis nominibus, ac differentiis." In it he describes three species of scabies; the one referred to is the second. He says: "Secunda sunt quædam animalia parva, et quidem ita parva, ut vix conspiciantur, tamen mulieres colligunt ipsa in summa acie acus, et manifestè apparet, ipsa moveri motu progressivo, etiam si minima sint; dicuntur autèm animalcula ista pediculi, vel pedicelli vulgo, et à barbaris istis syrones," &c. J. MERCURIALIS—*De Morbis Cutaneis, Libri duo*, Lib. I, Cap. 7, 1572; I cite the Venice Ed. of 1601, p. 34—shared the opinion of INGRASSIAS, that our acarus is a species of louse. He says: "nonnulli sunt pediculi, qui parum crescunt, et in superiore cute manent; sed tamen leviter perambulant, et corrodunt, atque isti pedicelli vulgo nuncupantur." The same view was taken by VIDUS VIDIUS—*De curatione generatim*, Lib. VI, Cap. 10, 1587; I cite Opera, Frankfort, 1626, T. II, p. 440—"Tertia species est eorum (*i. e.* of lice) quos recentiores Medici vocant Scirrones, vulgus pellicellos, quod inter pelliculam et cutem serpunt, sinuantes sibi veluti cuniculos

After the invention of the compound microscope animalcula invisible to the unaided eye were observed in a large variety of putrid substances, and as the notion of the putridity of the humors played a great role in the humoral pathology, the hypothesis suggested by the ingenious jesuit, Athanasius Kircher, [1658,]* that microscopical animacula or vermiculi were the true cause of pestilential diseases, found ready acceptance in certain quarters. The analogy of the itch-mite, studied anew with the microscope, particularly by Hauptmann and Cestoni,† led to the belief that the exanthematous diseases especially owed their origin to an acarus like parasite; but the doctrine of animated contagion was by no means limited to this class of disorders. It was extended by Christian Langius and Rivinus‡ to the most diverse affections, and undemonstrated

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seu vesiculas non suppurantes, quas si quis perforet exeunt albi, adeo tamen parvi, ut vix deprehendi oculis possint, non tamen fugiunt acriorem visum in loco maxime lucido, quod si inter ungues comprimantur, ubi extracti sunt, parvulum quendam sonitum edunt." GUILLAUME RONDELET—*Methodus curandorum omnium morborum*, Frankfort, 1592, Lib. I, Cap. 3, p. 18—in his chapter *De pediculari morbo*, expressed the same opinion: "Tertium, (genus,) quod cyrones vulgò appellant, qui nunquam extra erumpunt, sed semper intra cutim et cuticulam latitant." According to HEBRA, (*loc. cit.*,) the same opinion was expressed still later by SAMUEL HAFENREFFER, [1630.] Several of the foregoing extracts were collected towards the close of the sixteenth century by J. SCHENCKIUS—*Obs. Med. Rar.*, Lib. V, 1597; I cite the Frankfort Ed. of 1609, p. 771—in his article *De Syronibus*, which also contains extracts on the same subject from the writings of GABUCINUS, THOMAS À VEGA and WIRSUNG. A summary of the knowledge of the day on this subject will also be found in the treatise on insects of ULYSSES ALDROVANDUS—*De Animalibus insectis Libri septem*, Lib. V, Cap. 4, Bologna, 1602; I cite the Ed. of 1638, p. 544,—who combats the idea that "scirrones, eos vocant vulgus pellicellos," are identical with the Acari of ARISTOTLE. The contrary opinion, however, was maintained by THOMAS MOUFET, the English naturalist—*Insectorum Theatrum*, London, 1634, Lib. II, Cap. 23, p. 266—whose learned chapter *De Syronibus* is the last important notice of these mites published before the compound microscope was brought to bear upon the subject. This author was well acquainted with the previous literature of the subject, and cites many of the authorities quoted above, together with some others. He states that these parasites are called in English *wheule-wormes*, and relates the case of the beloved wife of a certain old knight who was so afflicted by them in all parts of her body that at length, worn out by the irritation and loss of sleep, she died. He appears himself to have observed the true situation of the parasite, for he writes: "Syrones istos non in ipsis pustulis, sed prope habitare." He, too, refers to the skill acquired by certain women in extracting the mites, quoting an epistle from a certain Doctor Le Jeune, surgeon to the king, who having tried in vain to relieve a patient afflicted by them, received the help of such an expert: "Tunc amici ad ægrotam fœminam quandam miserunt, quæ coram meo argentea adeo dextre et nullo cum dolore Syrones extraxit, ut mihi miraculo esset." The foregoing extracts will serve to illustrate the extent to which the knowledge of the itch-mite was diffused before the compound microscope was brought into use, and show that this knowledge both of the parasite and of the mode of extracting it constituted a part of the folks-lore of the peasantry, and probably therefore long antedates all written references to it. For the history of the progress of knowledge on this subject after the microscope was brought to bear upon it, I refer the reader to the learned article by HEBRA already mentioned, calling attention to the circumstance that as late as 1834, when the scientific men of modern Europe had begun to doubt the very existence of this parasite, the Corsican RENUCCI, who taught them once more how to find it, is said to have derived his precious knowledge from the old women of his native land. (HEBRA, *loc. cit.*)

* A. KIRCHER—*Scrutinium Phys.-Med. contagiosæ, luis quæ Pestis vulgò dicitur*, Rome, 1658. In this work he shows that all putridity generates worms, and that since the discovery of the microscope innumerable worms, invisible to the unarmed eye, have been discovered in putrid substances, [Sect. I, Cap. 7.] "Notum quoque hucusque est omnibus, vermes è putridis corporibus scaturire; sed non nisi post admirandum Smierosopii inventum, omnia putrida innumerabili vermium oculo non armato insensibilium fœtura scatere, cognitum fuit; quod et ego nunquam credidissem, nisi frequenti multorum annorum experimento id comprobassem," [p. 42.] He concludes from his experiments that each living substance by its putrefaction gives rise to specific animalcula: "Omne vivens ex putredine sua educit animal quoddam naturæ viventis congruum, et à cæteris omnibus differens." He then endeavors to prove (Sect. I, Cap. 8) that the putrefaction of bodies infected by pest gives rise to effluvia not merely of inanimate but of animated corpuscles: "Animatam minutissimorum et insensibilium animalculorum sobolem," [p. 50.] Of the minuteness of these animalcula or vermiculi he writes: "Sunt autem hi vermiculi pestis propagatores tam exigui, tam teones et subtiles, ut omnem sensus captum eludant, nec non nisi exquisitiss'mo smieroscopio sub seosum cadant, ntomos diceres; tanta verò identidem repullulant multitudine, ut sub computum non cadant," [p. 141.] More than once he declares that these vermiculi were actually observed in examinations made at his instance of the contents of the bubos of those dead of plague, [p. 142.] As capable of destroying these vermiculi, he recommended dilute sulphuric acid [spiritus vitrioli, p. 185] given internally, both for prophylaxis and cure, much as it has been recommended of late in certain quarters for cholera on account of its power of killing bacteria.

† A. HAUPTMANN—*Tractatus de viva mortis imagine*, Frankfort, 1650. According to HEBRA, (*loc. cit.*,) this writer was the first to make a drawing professing to represent the microscopical appearances of the itch-mite. I have not obtained access to a copy of this tract. SCHWIEBE (cited below) in the preface to his thesis makes the following extract from it: "Cridones, sive Draeunculi, Blattæ, Tineæ, vari et vermiculi illi corrodentes in morbillis, scabie et pustulis. Cyrones sive Acari, quos Germani die Reitliesen appellitare solent, quique Cicatrices causant atque excedunt ex ichore et seroso humore propullulant, quæ inseeta omnia mortis quædam sunt species, nisi enim iisdem resistatur, corpus destruere possunt utique." Whence it appears that HAUPTMANN attributed various diseases besides scabies to minute animal parasites. In this he preceded KIRCHER, [*op. cit.*, p. 57,] who was well acquainted with his labors, and cites with praise the tract above mentioned. I name H. CESTONI in this connection because he appears to have been the actual observer, and not G. C. BONOMO or F. REDI, both of whom have received the credit. The observations were promulgated in a letter from BONOMO to REDI, written in 1687. This epistle will be found in the works of REDI—OPERE, 1712; I cite the Milan Ed., T. III, 1812, p. 439—and translated into Latin by LANZONI in the *Ephem. Med.-Phys. German*, Dec. II, an. X, [1691.] Appendix, p. 33.

‡ CHRISTIAN LANGIUS edited in 1659 (Leipsic) an edition of the work of KIRCHER cited above, in his preface to which the germs of his doctrine will be found. He there extends the hypothesis of HAUPTMANN and KIRCHER not merely to "morbilli, variola, febresque petechiales," but also "funesta illa puerperarum furia, purpura," "cephalalgiæ contumaces, pleuritides intolerabili dolore comitatæ, rosiones stomachi et intestinorum, convulsiones epilepticæ, torturæ arthriticæ et hujus farinæ consimilia pathemata." All which he derives "ab exhalationibus et effluviis animat's." In this preface also he promised the publication of a work to be entitled "*Pathologia Animata*," in which his doctrine should be more fully expounded. This, however did not appear till after his death; it is contained in his collected works—*Opera Omnia*, Frankfort, 1688—under the title *Pathologia Animata, seu Animadversiones in Path. Spagiricam cl. viri P. J. Fabri*, and is a prolix work of nearly 700 pages of small type, in which his favorite "animated putridity" serves us the explanation of almost all diseases. A. Q. RIVINUS, who was professor of physiology and botany at Leipsic from 1691 to 1723, taught this doctrine in his lectures. A glimpse of his views is given in the thesis of his student J. J. SCHWIEBE—*De Pruritu Exanthematum ab Acari*, Leipsic, 1722—in which the various exanthematous diseases are each affirmed to be derived from a special acarus. A comparison is drawn with the macules on the leaves, &c., of plants which result from the bites of insects, and the hypothesis boldly stated that diversity in the parasite gives rise to diversity in the disease: "Mirum autem non est, symptomata diversa nasci ex ipsa vermiculorum varietate," [p. 17.] Compare, in this connection, the curious work

diversities in the genera and species of the animal parasites were assumed to explain the diversity of the diseases generated, just as has been done of late by the "bacteria fanatics"* in the case of the vegetable parasites. Christian Langius taught that in both diarrhœa and dysentery the intestinal flux is the consequence of the velication and urtication of the mucous membrane by innumerable vermiculi invisible to the naked eye; he affirmed that if the ramenta and strigmenta of the dysenteric stools were examined by the microscope the curious physician would find swarms of these vermiculi in them; and designated the acrid matter, which by its action on the intestinal mucous membrane produces the flux, by the phrase "animated or verminous putridity," which is so conspicuous in his pathology.†

These views were rather speculative suggestions than the fruit of actual observations; but in the case of dysentery the lacking observations appeared to be supplied in 1757 by Nyander's essay, Exanthemata Viva, the publication of which by his teacher, Linnæus,‡ secured for it more attention than it would otherwise have received. The arguments it contained in support of the speculation that acari, similar to those of scabies, cause many grave diseases was no longer novel, but Nyander's statement that his friend Rolander had actually observed myriads of living acari in his own stools, while suffering from a mild dysenteric attack, appeared to be important, because countenanced by the great naturalist. Linnæus, in the twelfth edition of the Systema Naturæ, made a separate species of the Acarus dysenteriæ, and for a time the opinion that dysentery is caused by a minute animal parasite appeared to rest upon the basis of actual observation.

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of NICOLAS ANDRY—*De la Génération des Vers dans le Corps de l'homme*, Paris, 1700; of which there is in our library an English translation, "*An Account of the Breeding of Worms in Human Bodies*," London, 1701. The author used a microscope sufficiently powerful to enable him to see the spermatozoids, which he describes under the head of spermatic worms, (spermatici,) and gives a tolerable figure of them. He asserted that he saw worms in the blood, (sanguinei:) "They keep within the Vessels, and swim in the midst of the Blood, as Vinegar-worms do in Vinegar. They are very slender and small." "'Tis probable, that sometimes when they are too big to be receiv'd by the Veins, they remain in the Flesh, where they occasion Fellons, Risings, and sometimes an universal Scab," (p. 86.) So also there were Elcophagi that "gnaw Ulcers;" Venereal Worms (venerei) that "occasion all the Symptoms of Venereal Diseases," (p. 89.) "Cancers are all full of imperceptible Worms," (p. 198,) which indeed cause the disease; and so also "Worms may occasion Tumors and Excrescencies in the Body, as they do in the Leaves of Oak," &c., (*loc. cit.*) Our author was not quite certain of the doctrine of HAUPTMANN and KIRCHER that worms are the cause of "Malignant Fevers," though he evidently inclined to that belief. (See p. 109.) See also the second letter of HARTSOEKER, appended to this work, [p. 216,] who remarks: "I believe that Worms occasion most Diseases with which Mankind is attack'd."

* *Bakterienfanatiker*—BIRCH-HIRSCHFELD in Schmidt's Jahrb., Bd. 166, 1875, p. 169. I do not know who deserves the credit of originating this term, which has come into use in Germany of late years and deserves to be perpetuated.

† CHR. LANGIUS—*Pathologia Animata*, [cited above,] p. 464 *et seq.* He urges his views as to diarrhœa especially in connection with the species which accompanies malignant fevers: "Circa symptomaticam diarrhœam, quæ in febribus malignis, præsertim iis, quas exanthemata signant, accidere quandoque solet, id omninò adscribendum advertendumque est, quod verminosa tunc putredo tantoperè redundans atque ferociens intestina seu alvum sic lancinet, vellicet ac urgeat, ut sæva ejusdem proluvies hinc oriatur." With regard to dysentery he says: "Est itaque Dysenteria frequens alvi, sed cruenta, strigmentosa ac purulenta dejectio cum dolore morsuque ventris maximò et intestinorum exulceratione juncta, atque à materia acri erodente et intestinis peculiariter infesta (sub qua phrasi ego animatam ac verminosam putredinem comprehendo) orta;" and again: "Subjiciant quæso Medici curiosi aliquid de ramentis et strigmentis illis, quæ à dysenterieis excernuntur, dicto jam smicroscopio, et cum admiratione vermiculorum turmas videbunt." I do not understand him to say that he actually saw these dysenteric vermiculi, but only to express his belief that they would be seen, if looked for.

‡ J. C. NYANDER—*Exanthemata viva*, [June 23, 1757,] Amœnitates Academicæ, T. V, Stockholm, 1760, p. 92. He was familiar with the speculations of HAUPTMANN, KIRCHER and LANGIUS, all of whom he quotes. He described the acarus which causes scabies, and argued that small-pox, whooping-cough, measles, plague and syphilis are of similar origin. Of dysentery he says: "Dysenteria epidemica Scabies est intestinorum interna, ut ex dissectionibus cadaverum, Dysenteria defunctorum, patet." This opinion, however, was not based, as ROKITANSKY has erroneously suggested, (C. ROKITANSKY—*Der dysenterische Prozess auf dem Dickdarme*, Oester. Jarhb., Bd. XX, 1839, S. 83. The same statement occurs in the earlier editions of his *Lehrb. der path. Anat.* See Sydenham Society's transl., Vol. II, London, 1849, p. 83. It is omitted from the 3d revised ed., Bd. III, Vienna, 1861, S. 207.) upon any actual observations of the cadavers of dysenteric subjects, but wholly upon the following considerations: It had been related by BARTHOLINUS that a certain Danish physician, who lived in the previous century at Helsingburg, often suffered from dysentery, and at such times had observed living insects in his stools. A friend of NYANDER, named ROLANDER, who was an entomologist, had himself several mild attacks of dysentery (?) which he cured with rhubarb and paregoric, and was induced during one of these attacks to examine his own stools to see if he could verify the statement of BARTHOLINUS. He asserted that he found in them myriads of animalcula similar to the acari of flour, and discovered their source to be a goblet made of juniper-wood out of which he drank beer at night; multitudes of the acari were found in the fissures on the inside of this vessel. I do not understand that either NYANDER or LINNÆUS ever saw these acari; their existence appears to rest entirely upon the testimony of the sick man. The words of the thesis are: "Hoc facto (*i. e.*, the discharges examined with the microscope) in hisce myriades animalculorum se vidisse, quæque accurate descripta, esse acaros, et acaris quidem farinæ similes, æger dixit." However this may be, LINNÆUS introduced the *Acarus dysenteriæ* as a separate species into the 12th edition of the *Systema Naturæ*, (Stockholm, 1767, T. I, Pars 2, p. 1024,) with a description of its habits, drawn from the statements of ROLANDER; and the doctrine that dysentery is a "scabies intestinorum interna" has been attributed to him by numerous writers from the time of SIR JOHN PRINGLE (*Obs. on the Diseases of the Army*, 7th Ed., London, 1774, p. 256) to the present day. Several of our modern text-books also repeat the erroneous assumption of ROKITANSKY referred to above; but the doctrine was not based upon any such anatomical minutiæ as the great pathologist refers to in the passage cited: it rested chiefly upon the previously propounded doctrine of animate contagion, the only new fact brought forward in support of which was the discovery of the acari, which ROLANDER said he saw. I may add that PRINGLE—*op. cit.*, p. 249—seems to have fallen into an error not unlike that of ROKITANSKY.

But subsequent investigations did not confirm the supposed discovery of Rolander. Those who looked for acari in the dysenteric stools utterly failed to find them, and as the general doctrine of animate contagion lost credit, its application to dysentery passed completely out of sight. What Rolander really saw must remain a matter of conjecture. It is probable enough, in view of the declaration of Lionel Beale, that he also has seen living acari in the discharges from the bowels,* that the statements were made in good faith, with perhaps some exaggeration only as to numbers, and Beale's hint, that acari may fall into the stools after they are passed, is perhaps a sufficient explanation.

Since the modern improvements of the compound microscope have so much facilitated such observations several minute animal forms, belonging to the protozoa, have been observed in the stools of patients suffering under fluxes. I may mention especially the Paramaecium coli of Malmsten, the Cercomonas intestinalis of Lambl and the Amœba coli of Lösch.† It has even been suggested by Malmsten and Lösch that the low forms they have described may act as local irritants and provoke, or at least keep up, the flux, just as the larger parasites of the alimentary canal (intestinal worms) have sometimes been

* LIONEL S. BEALE—*The Microscope in its Application to Practical Medicine*, 3d Ed., Amer. reprint, Philadelphia, 1867, p. 196—"I have found numerous living acari in matters passed by the bowels, but did not determine the species, nor could I ascertain positively whether they had passed alive from the bowel or had merely fallen into the dejection afterwards." Whether a living acarus swallowed with the food or drink would be passed alive is perhaps a doubtful matter. Certainly its chance of doing so would seem to be best in subjects in whom from any cause the digestion is enfeebled, as in lientery, (whether dysenteric, or resulting from diarrhœa.) BRINTON and BLOOD, however, have published cases in which the larvæ of some undetermined species of blow-fly appear unquestionably to have passed undigested through the intestinal canal of healthy adults—*Larvæ of certain species of blowfly expelled alive from the bowels*, Beale's Archives of Medicine, Vol. III, 1863, p. 133. In BLOOD'S case a purge had been given, but not in BRINTON'S. This experience seems to suggest the possibility that other low animal forms may occasionally pass through the human alimentary canal alive, but it must be admitted that BEALE'S observations with regard to the acari lack confirmation. The few acari seen by T. R. LEWIS—*Sixth Annual Report of the Sanitary Commissioner with the Government of India*, (1869.) Calcutta, 1870, Appendix A, p. 135—were all dead: "On two or three occasions, semi-disintegrated *acari* were observed in the stools examined, which had, in all probability, been swallowed with the food, in bread perhaps, and passed through the intestinal canal without being very much broken up, as may be seen from the figure." [Fig. 13, Plate 4.] This observer also saw cysts in the stools which "corresponded precisely" with the eggs of acari.

† LEEUWENHŒK—*De ortu et defluvio capillorum, &c., &c., de vivis animalculis existentibus in excrementis, &c.*, p. 37 *et seq.*, in Anatomia et Contemplationes, Leyden, 1687—described three different kinds of infusorial animalcula in the mucus of the human intestine, for which EHRENBERG—*Die Infusions-Thierchen als vollkommene Organismen*, Leipsic, 1838, S. 331—sought in vain, remarking, "Er scheint *Vibrio Bacillus*, einen *Eodo* oder *Monade* und eine *Acaride* (schleimhautfragment?) gesehen zu haben." Modern microscopists with their improved instruments have been more fortunate. P. H. MALMSTEN—*Infusorien als Intestinal-Thiere beim Menschen*, Virchow's Archiv, Bd. XII, [1857,] S. 302—found in the discharges from the bowels of two patients an oval, ciliated, infusorial animalcule about the 0.1 of a millimetre in length, which he named *Paramaecium coli*, and of which he has given an excellent figure, [*loc. cit.*, Taf. X.] The first patient was a man 38 years old who had long suffered from lientery. The second, a woman 35 years old, suffering from chronic entero-colitis, of which she died. The infusoria were found in the stools of both cases in great numbers. In the second case, on autopsy, follicular ulcers associated with diphtheritic inflammation were observed in the colon. In this case the contents of the intestinal canal after death were examined for the infusoria, which were found in the large intestine only, where they were most numerous in the mucus which coated the comparatively healthy mucous membrane between the ulcers. The author suggests that these infusoria may possibly by their presence have provoked the fluxes in which they were observed. W. LAMBL—*Mikroskopische Untersuchungen der Darm-Excrete*, Prager Vierteljahrschrift, 1859, B. 1, S. 51—described, under the name of *Cercomonas intestinalis*, a tiny monad (Plate I, Fig. 2) which he has seen in myriads in the jelly-like mucous discharges of children suffering from diarrhœa in the Franz Josef-Kinder-Spital at Prag. It is a delicate oval object .018 to .021 millimetres in long diameter. For a more minute description and additional figures see, by the same author, *Beobacht. u. Studien aus dem Franz Josef-Kinder-Spitale*, Theil I, 1859, S. 351 *et seq.*, *Die parasitischen Organismen des Darm-Canals*, [Taf. 18,] in which he mentions finding this parasite after death in the small intestine, especially the duodenum, as well as in the large intestine. In this latter work he describes also the occurrence, in the stools of children suffering with enteritis, of minute *Amœbæ*, (the chief mass of their bodies .0045 to .0062 millimetres in diameter,) of *Arcelli*, or flask-like infusoria, (.009 to .013 millimetres in long diameter,) and *Difflugiæ*, or bladder-like infusoria, (.012 to .016 millimetres in diameter.) C. DAVAINE—*Traité des Entozoaires*, Paris, 1860, p. vi, et 67—under the designation *Cercomonas hominis*, describes two species of monads similar to the *C. intestinalis* of LAMBL, but somewhat smaller; one provided with a caudal filamentary appendage, the other with two such appendages, one at each extremity. He saw the first in cholera stools, the second in the stools of typhoid fever. A critical discussion of the subject will be found in the work of R. LEUCKART—*Die Menschlichen Parasiten*, Bd. I, Leipsic, 1863, p. 149—who throws doubt on the nature of most of the supposed animal forms described by LAMBL, especially the *Arcelli* and *Difflugiæ*, and suggests that his *Amœbæ* were really isolated tissue elements, such as white blood corpuscles, &c., which possess an amœboid motion; he admits, however, the *Cercomonas intestinalis* and the *Paramaecium coli*. Quite recently F. LÖSCH—*Massenhafte Entwickelung von Amöben im Dickdarm*, Virchow's Archiv, Bd. 65, [1875,] S. 196, [also Taf. X, Fig. 1–3.]—has again described *Amœbæ* seen in large numbers in the stools of a man 24 years old who had long suffered from diarrhœa which assumed a dysenteric character, and finally proved fatal. The *Amœbæ*, which were found in the stools in considerable numbers, were roundish or oval when at rest, varied from 20 to 30, or even 35, micro-millimetres in long diameter; when stretched out they sometimes attained 60 micro-millimetres. On the autopsy it was found that diphtheritic dysentery had supervened upon an intestinal catarrh, and diphtheritic sloughs, partly detached, were observed in the lower part of the ileum and in the cæcum. In the descending colon and sigmoid flexure there were numerous cicatrices of follicular ulcers and some unhealed ulcers, also some mucous cysts. LÖSCH proposed to name this parasite *Amœba coli*. He thinks they played a considerable part in the disease, and if they did not cause it, at least proved a source of irritation and prevented the ulcers from healing. In support of this view he cites several experiments in which one to two ounces of the fresh stools of the patient were injected, both by the mouth and per anum, into a dog, and seemed to provoke in one instance some intestinal catarrh, which he ascribes to the *Amœbæ*. Certainly not a very conclusive mode of reasoning for the adherents of the bacteria hypothesis would rightly claim that the matter injected was full of vegetable parasites, and that these produced the disease, and indeed any other morbid matters which may constitute the real poison in these cases were evidently also present. Very similar to the figures of *Cercomonas intestinalis* referred to above, are those figured by T. R. LEWIS, [p. 150, *op. cit.*, *supra*, and Plates 15 and 16,] which he observed both in the cholera stools and in a liquid stool passed by a healthy individual.

supposed to do;* but the evidence in favor of this view cannot be regarded as at all satisfactory. Here too I may refer to the Distoma haematobium of Bilharz, the ova of which were found by Griesinger† to be present, in great numbers, in the coats of the intestines of subjects dead of Egyptian dysentery. The suggestion that the disease might be produced by their action occurred to that prudent observer, who, however, soon convinced himself that they were by no means a constant concomitant of the dysentery of Egypt, and abandoned the notion of their causal significance. Lastly, I may mention the discovery by Normand‡

* The discovery of intestinal worms in the bodies of those dead of dysentery, and the observation of their presence in the stools of certain cases, long ago gave rise to the idea that these worms were a cause of dysentery. Thus we read in the *Sepulchretum* of BONETUS, Lib. III, Sect. XI, Obs. 21, [Geneva Ed., 1679, p. 860,] an observation borrowed from FONTANUS entitled "*Dysenteria à vermibus excitata.*" See also *Dysenteria animata cum vertigine nocturna*, Ephem. German. Dec. II, an. 7, [1688.] Appendix, p. 158. In the *Commerc. Litterarium Norimbergæ*, an. 1743, p. 53, there is mention of a case reported by J. P. WOLF, under the title "De dysenteria maligna verminosa, cum pustulis squamosis crustæ lacteæ similibus, conjuncta." NICOLAS DU SAULSAY—*Vandermonde's Jour. de Méd.*, T. VI, [Paris, 1757,] p. 380—described an epidemic of dysentery which prevailed at Fougeres and its vicinity in the latter part of 1756, of which he says that intestinal worms were the principal cause: "On ne peut douter que les différentes especes de vers ne soient la cause principale de cette dyssenterie." Great numbers of worms are said to have been found by SEVOY in the bodies of the victims of this epidemic. In subsequent volumes of the same journal BOUCHER mentions—T. VII, [1757,] p. 236—an epidemic of "la dyssenterie verminеuse" which ravaged the environs of Lille in 1750, and BAUME—T. LXIX, [1786,] p. 257—relates the case of a dysentery of six months' duration cured suddenly by a dose of vermifuge, [helminthocorton;] great quantities of lumbricoid worms were passed, and from that time the patient rapidly recovered. SAUVAGES—*Nos. Meth.*, Amsterdam, 1768, T. II, p. 329—introduced "Dysenteria verminosa" into his nosology, chiefly on the testimony of DU SAULSAY, of whose narrative he gives an abridgement. PLOUCQUET—*Lit. Med. Digest.*, T. I, 1808, p. 424—cites a dissertation by MAY—*Casus de dysenteria verminosa*, Giessen, 1787—which I have not been able to see.

† THEODOR BILHARZ, in Kairo—*Distomum Haematobium und sein Verhältniss zu gewissen pathologischen Veränderungen der menschlichen Harnorgane*, Wiener Med. Wochenschrift, Jan., 1856, S. 49, u. 65. W. GRIESINGER—*Klinische und anat. Beob. über die Krankheiten von Egypten*, Vierordt's Archiv für Physiolog. Heilkunde, Jahrg. XIII, 1854, S. 561, Distomenkrankheit. BILHARZ announced the discovery of this parasite in a letter to VON SIEBOLD, May 1, 1851. Its pathological relations were investigated partly by himself, partly by GRIESINGER; the latter particularly inquired into its supposed connection with dysentery. Good accounts of the subject will be found in the works of F. KÜCHENMEISTER—*Animal and Vegetable Parasites of the Human Body*, Transl. of Sydenham Society, Vol. I, London, 1857, p. 277 *et seq.*; C. DAVAINE—*Traité des Entozoaires*, Paris, 1860, p. 312; R. LEUCKART—*Die Menschlichen Parasiten*, Bd. I, Leipsic, 1863, S. 617; and T. SPENCER COBBOLD—*Entozoa*, London, 1864, p. 197. The latter author designates the parasite *Bilharzia hæmatobia*, regarding it as properly a separate genus. The parasite is "a trematode helminth in which the male and female reproductive organs occur in separate individuals; the male being a cylindrical vermiform worm, measuring only half an inch or rather more in length, whilst the female is filiform, longer, and much narrower than the male, being about four-fifths of an inch from head to tail," (COBBOLD, *loc. cit.*) It has been found especially in the portal system of bloodvessels, and its occurrence has been recognized not only in Egypt, but also in South Africa and the Mauritius, (COBBOLD.) The eggs are oval or oblong, often sharply pointed at one extremity, and measure on the average $\frac{1}{150}$ of an inch in long diameter. While still in the body of the parent the eggs develop into minute ciliated animalcula, which exhibit lively movements; these measure on the average about $\frac{1}{327}$ of an inch in long diameter. This parasite, according to BILHARZ and GRIESINGER, produces a characteristic disease of the urinary organs, of which hæmaturia is a prominent symptom, and which is often accompanied by anæmia and great prostration of the vital powers. The patients frequently die, when bloody extravasations, fungus-like thickenings, even ulceration of the mucous membrane of the bladder are found. The lining membrane of the ureters and renal cavities is also often more or less affected, and the kidneys are sometimes enlarged and congested. According to BILHARZ, (*op. cit.*, p. 66,) these phenomena are due to the females entering the small vesical bloodvessels and there laying their eggs, which obstruct the circulation, giving rise to passive hyperæmia of the adjacent capillaries with consequent exudations, or to ruptures of the vessels through which the eggs or ciliated embryos escape into the tissues, or upon the free surface of the mucous membrane. This explains also the frequent occurrence of the eggs in the urine. Now, the lesions of the vesical mucous membrane just described, are not unlike those of the intestinal mucous membrane in dysentery, and GRIESINGER (*op. cit.*, p. 570) accordingly tells us that when, after March 19, 1852, he not unfrequently found the distoma eggs in the intestinal walls of subjects dead of dysentery, the thought for a moment arose in his mind that this parasite might be the cause of Egyptian dysentery: "da konnte freilich einen Augenblick lang der Gedanke auftauchen, das Distomum möge sich zu den endemischen, acuten und chronischen Dickdarmerkrankungen verhalten wie der Acarus zur Krätze." But such an acute observer did not long indulge this dream. He tells us that he soon found that in numerous cases of Egyptian dysentery the most careful search failed to find the parasite, and that he ultimately convinced himself that the distoma process was a pathological accident which might be superadded to dysentery, but could not be regarded as its cause. According to KÜCHENMEISTER, (*op. cit.*, p. 285,) BILHARZ came to the same conclusion. COBBOLD, (*op. cit.*, p. 203,) in his otherwise excellent abstract of the pathological appearances observed by GRIESINGER in the intestine, has omitted to mention this conclusion. I notice also with regret that the notion that this parasite may stand in a causal relation to dysentery is regarded with favor by AITKEN—*Science and Practice of Medicine*, 3d Amer. from 6th London Ed., Philadelphia, 1872, Vol. I, p. 205; Vol. II, p. 657.

‡ A. NORMAND—*Mémoire sur la diarrhée dite de Cochinchine*, [Archives de Méd. Navale, Jan., 1877, p. 35 *et seq.*] This gentleman is a naval surgeon (médecin de 1re classe de la marine) of whose sincerity I can have no doubt. He publishes a minute description of the parasite, prepared by M. BAVAY, professor of natural history in the Toulon school of naval medicine. From this it appears that there are no generic distinctions between the Anguillula stercoralis and the well-known and widely-distributed Anguillula terrestris, (or A. fluviatilis.) which is famous for its tenacity of life, and which has often been encountered in the intestinal canal of some of the lower animals. BAVAY says: "L'anguillule stercorale peut conserver ce nom qui lui a été donné dès sa découverte; elle diffère en effet fort peu de l'anguillule terrestre, *Rhabditis terricola* de Dujardin (genre *Leptodera* de Schneider), et ses différences ne paraissent pas d'ordre générique. L'espèce seule est nouvelle et peut être caractérisée ainsi: *Rhabditis* (Dujardin) *stercoralis* (nobis), *Leptodera* (Schneider) *stercoralis*; le nom de *stercoralis* lui a été donné en raison de l'habitat qu'on lui connaît," (p. 36.) Then follows an elaborate description, illustrated by an excellent wood-cut, which represents the adult male and female and the young in various stages of development. These so closely correspond to the well known descriptions and figures of the A. terrestris that they need not be reproduced here. NORMAND reports that he has sought in vain for this parasite in cases of diarrhœa contracted in France, or in diarrhœa consecutive to dysentery contracted in any other colony than Cochin China; nay, he admits that it is only in a certain number of Cochin China cases that he has been able to find it, (p. 41;) but these facts do not stagger him. He assumes that in the Cochin China cases in which he sought for it in vain it had previously been present, but had disappeared, or was present in such small numbers as to escape detection, as happened to him several times with patients in whom he afterwards found it. Hence he has no hesitation in speaking of the diarrhœa of Cochin China as "une entéro-colite verminеuse," or in regarding the parasite as its cause. But it is no longer wise to assume that every living organism observed in diarrhœa stools may forthwith be regarded as the cause of the disease. Before that view can be accepted it ought at least to be shown that the pathological condition in question never exists except in the presence of the accused parasite. But we know that the lesions of Cochin China diarrhœa differ in nothing from those of the chronic fluxes of other tropical countries, in which our author admits his parasite does not occur; nor has he made any attempt to reproduce the disease by means of the parasite. While this page is passing through the press I see by the Lancet (July, 1877, p. 139) that Prof. BAVAY has found still another form of *Anguillula*, which he proposes to call *A. intestinalis*, in five cases of Cochin China diarrhœa. The original article (Arch. de Méd. Navale, July, 1877) has not yet reached me.

of a species of Anguillula about a millimetre long, which he has observed in the stools of certain cases of the diarrhœa of Cochin China, and which he supposes to be the cause of that particular form of flux. This latest speculation does not appear to have any more solid foundation than its predecessors.

So far as I know, the earliest suggestion that dysentery might be caused by vegetable parasites in the alimentary canal was made by Baly,* who was induced by the publication, in 1849, of the observations of Brittan and Swayne as to certain forms supposed to be of a fungoid nature, found in the dejecta of epidemic cholera, to publish a drawing he had made in 1846 of similar bodies observed in the dysenteric stools during the occurrence of epidemic dysentery in the Millbank prison. Unfortunately this drawing and the accompanying description are not of such a character as to permit the identification of the objects described. Baly compared them to "the individuals of the genus protococcus," which he said they closely resembled, but their real nature has never been determined.

During the civil war J. H. Salisbury,† in his report to the Surgeon General of the State of Ohio, on the "chronic diarrhœa" of our soldiers, described, under the name of algoid cells, certain forms which he observed in the stools of that disease, and which he compared to Protococcus cocoma. They were perhaps similar to the forms observed by Baly, but the description, in this case also, is too imperfect to render positive identification possible. In the same paper Salisbury gives prominence to the occurrence in the stools of the "yeast plant," (torula forms,) which, together with the carbonic acid produced by the saccharine fermentation of imperfectly digested amylaceous food, especially hard bread, he supposes to act as the chief factors in the production of the chronic diarrhœa. Much as this paper in many respects deserves criticism, its author should be credited with having independently observed the prevalence of torula forms in the lientery of soldiers fed largely upon hard bread, which is certainly a fact, although it must probably be looked upon as a consequence of the disease rather than as its cause.

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* WM. BALY—*Note on the presence of peculiar microscopic bodies in the discharges of epidemic dysentery*, The London Med. Gazette, N. S., Vol. IX, [1849,] p. 589. He thought the bodies he figured were very similar, but not identical with those BRITTAN and SWAYNE had observed in cholera. If the latter were fungi, as QUEKETT had supposed, the former were fungi also. He had examined the bloody mucus in two cases of sporadic dysentery without finding them, and thought it uncertain whether they were peculiar to epidemic dysentery or of constant occurrence in it. The paper of BRITTAN, containing his account of the observations of SWAYNE and himself, will be found in the same volume, [p. 530,] and the opinion of QUEKETT in an appended letter. This publication gave rise to considerable discussion. WM. BUDD—*Malignant Cholera*, London, 1849, p. 4—declared that he had detected "the same organisms in great numbers in almost every specimen of drinking-water which I was enabled to obtain from Cholera-districts." GEORGE BUSK, then president of the Microscopical Society, however, asserted that they consisted of altered blood corpuscles, starch granules, the cellular structure of the inner coat of the bran of wheat, and spores of the *uredo*, or smut of wheat—London Med. Gazette, Vol. IX, N. S., 1849, pp. 692 and 733. M. J. BERKELEY, then the most competent authority on the subject of fungi in England, denied that the spores of *uredo* were present, and doubted indeed whether the bodies observed were fungi at all, (*op. cit.*, p. 1035.) The cholera committee of the Royal College of Physicians appointed WM. BALY and WM. W. GULL a subcommittee to investigate the subject. They reported that the so-called cholera fungi consisted in part of substances taken as food or medicine and in part of bodies of doubtful nature, but certainly not fungi. They mentioned, among the bodies identified, fragments of vegetable tissue, globules of calcareous matter (from chalk mixtures and other medicines) and altered starch grains, (*op. cit.*, p. 775.) T. R. LEWIS—*Sixth Annual Report of the Sanitary Commissioner with the Government of India*, (1869.) Calcutta, 1870, Appendix A, p. 131 *et seq.*—in his comparatively recent examination of the subject adds to these bodies ova of various kinds (of intestinal worms, &c.) as presenting appearances similar to those described.

† J. H. SALISBURY—*Chronic diarrhœa and its complications*, Annual Report of the Surgeon General for the year 1864, made to the Governor of the State of Ohio, Columbus, 1865, p. 25 *et seq.* This paper professedly relates to "chronic diarrhœa," but it is evident that under this head the writer embraces all the various forms of dysentery as well as of diarrhœa which occurred among our troops during the war. He asserts that the cause of the disease is primarily a scorbutic condition of the system resulting from camp-diet, and especially from the too exclusive use of hard bread. By this "is produced a highly saccharine or glycogenic condition of the system," in which "cryptogamic (yeast and algoid) plants are developed in vast numbers in the alimentary canal, germinating large quantities of carbonic acid which with the ferment organisms act as a peculiar irritant poison and cathartic," &c., p. 78. He describes the jelly-like lumps, which German writers have compared to frogs' spawn, as "small masses of gelatinous (colloid) matter," and says they are made up of large algoid cells and filaments enveloped in a jelly-like substance. These algoid cells, or colloid cells as he sometimes calls them, resemble several low algoid forms, such as the Protococcus cocoma and the Furfuraria lumbricales of KÜTZING, or the Lemania incurvata or Vaucheria clavata of HASSALL, especially the last-named forms. The yeast plants of which he speaks he says consist of the torula cerevisiæ and a larger species of torula. He also observed the sarcina ventriculi and another smaller celled species of sarcina, and two or three species of confervæ, the latter of which "occur abundantly in all well-marked cases." Occasionally "the vegetating spores and mycelium of a species of penicillium are met with in the colloid matter." I do not pretend to identify the "algoid cells" of SALISBURY, and must remark that a perusal of the report cited and of other papers by the same author has not impressed me favorably as to the trustworthiness of any of his observations. What confidence can be felt in an observer who affirms that he frequently meets in the fluid stools of diarrhœa "masses of highly refractive polyhedral cells," "each cell of which contains a crystal of sugar," and who describes pathological processes pretended to have been observed in the villi (*sic*) of the large intestine!

The more modern speculation that a species of bacteria acts as the cause of dysentery dates back only to the observations of Klob, [1867,] though the existence of these low vegetable forms in the dysenteric stools had previously been mentioned by several writers, of whom the earliest I know is Lebert,* who spoke of the occurrence of "vibrios" in these discharges as long ago as 1845. Klob† found in the stools of dysentery forms very similar to those he had observed in epidemic cholera, viz: spore-heaps [Sporen-Häufchen] or groups of excessively minute granules imbedded in a transparent jelly, [the Zoogloœa of Cohn,] and rod-like bacteria, single, in pairs, in groups, or arranged end to end in chains. Generally these forms were less numerous than in cholera dejecta; in one case, however, he met enormous quantities. He thought, also, that the bacteria rods in dysentery were more slender and longer than those of cholera.

But all the forms described by Klob occur also in the normal stools, and his observations would consequently have attracted but little notice had not the doctrine they suggested been vitalized by Hallier,‡ [1869.] This ingenious speculator applied his micrococcus theory to dysentery also. He frankly admitted that the vegetable forms he found in the dysenteric stools did not differ in any visible way from those he had previously found in the stools of cholera, abdominal typhus and other infectious diseases; indeed he admitted they can be found in ordinary diarrhœa and in the healthy stools. But he claimed by culture experiments to have demonstrated the inherent diversity of the micrococci in all these cases. By proper culture the micrococci of dysentery developed into a genus of fungus, intermediate in characters between the genera Ustilago and Tilletia, for which he proposed the name of Leïosporium dysentericum. I will not occupy space by repeating his description of this plant, because subsequent criticism has shown the untrustworthiness of his methods of culture and thus deprived the observation of all significance.§

Nevertheless the persistence in a modified form of the general hypothesis that bacteria are in some way disease-producers has permitted the survival, in certain quarters, of the doctrine that dysentery is thus caused. This doctrine appeared to be favored by the observations of Basch‖ on the pathological anatomy of the diseased intestine, which will be discussed hereafter, and as late as 1874 received the assent of Virchow,¶ whose splendid rhetoric has lent plausibility to arguments which appeal almost as much to faith as to reason. For it must be admitted that up to the present time no vegetable forms have been observed, in the dysenteric stools, which differ morphologically from those observed in healthy individuals, and that no reasonably convincing evidence of any intrinsic difference, not morphologically expressed, has as yet been brought forward. The doctrine of vegetable contagion in dysentery at the present day may, in fact, be said to be in a very similar condition to that of the doctrine of animalcular contagion when Christian Langius wrote. Whether the modern doctrine will fare any better in the hands of future investigators, than its prototype of the seventeenth century has done in the present age, remains to be seen.

* H. LEBERT—*Physiologie pathologique*, Paris, 1845, T. I, p. 218.

† J. M. KLOB—*Path.-Anat. Studien über das Wesen des Cholera-Processes*, Leipsic, 1867, p. 41.

‡ E. HALLIER—*Ueber den Parasiten der Ruhr*, Zeitschrift für Parasitenkunde, Bd. I, 1869, S. 71; also *Die Parasiten der Infectionskrankheiten*, op. cit., S. 176, and Taf. IV, Fig. 52. The material studied by HALLIER was afforded by an epidemic of dysentery in Weimar during 1868, an account of which has been published by L. PFEIFFER—*Die Ruhrepidemie von 1868 in Weimar*, op. cit., S. 1. HALLIER found in this material micrococcus, isolated and in colonies, rod-like bacteria, and a number of single and double spores of large size and brownish color, all which he has represented in a very neat figure as seen with a magnifying power of 540 diameters. Of the *Leïosporium dysentericum* I have seen no figure.

§ See notes to p. 282, *supra*.

‖ S. BASCH—Remarks before the *k. k. Gesellschaft der Aerzte*, Oct. 16, 1868, in Oester. Zeitschrift für Prakt. Heilk., 1868, No. 44, S. 819; also *Anat. und klin. Untersuch. über Dysenterie*, Virchow's Archiv, Bd. 45, 1869, S. 201.

¶ VIRCHOW—*Die Fortschritte der Kriegsheilkunde besonders im Gebiete der Infectionskrankheiten*, Berlin, 1874. See note † to p. 282.

6. *Accidental matters derived from the food and medicines taken.*—The dysenteric stools may be accidentally colored by any of the articles of food or medicine which have been described as producing a similar effect in diarrhœa,* and substances of the most diverse nature, derived from the imperfectly digested food, may find their way into the discharges. Among the ingredients of this character, considerable interest attaches to the little semi-transparent masses which have been compared to grains of boiled sago and frogs' spawn.† These have been supposed by some excellent observers, as Finger, Griesinger, Bamberger, and recently Heubner,‡ to originate in the ulcerated solitary follicles of the colon, and therefore to afford clinical evidence of the existence of follicular ulceration. Virchow, however, has pointed out that if these bodies be treated with iodine they acquire a blue color, and remarked with bitter sarcasm that what has been called sago-like mucus is much more frequently mucus-like sago.§ Moreover it has been shown by Frerichs ‖ that in certain abnormal conditions of the digestive processes the starchy matters of the food are transformed into a tough, stringy, semi-transparent substance very similar to mucus, and the same transformation can be imitated out of the body by inducing lactic acid fermentation in fluids rich in starchy matters. Frerichs observed this condition in the vomited matters and contents of the stomach in certain diseases of that organ, and Virchow ¶ repeatedly noticed it in catarrhal diarrhœa and dysentery.

Heubner has recently reaffirmed the old view of the origin of these bodies, in a somewhat modified form, suggesting that the follicular ulcers serve as moulds into which the mucus secreted by the inflamed mucous membrane is pressed, and, having been moulded into shape, that it falls out again into the contents of the bowels. He admits** that he did not apply the iodine test, being unacquainted with Virchow's views, but appears to think the presence of a few mucous corpuscles, epithelial cells and free nuclei, which he observed in some of these bodies with the microscope, decisive as to their nature. Such elements are, however, too abundant in the intestinal secretions of dysentery not to be likely to become imbedded in altered starchy matter while passing through the alimentary canal.

During the war of the rebellion the frogs'-spawn bodies were abundantly observed both in acute dysentery and in the chronic fluxes. They appear to have particularly arrested the attention of Salisbury,†† who correctly described them as "little jelly-like lumps disseminated through the fecal matters," but erroneously supposed them to be composed of a "gelatinous" or "colloid" substance. I myself not only found that iodine gave a blue color to almost every well characterized lump of the sort tested, but I usually observed with the microscope large numbers of torula-like cells, resembling those which are developed during the fermentation of starchy substances; I must, therefore, regard the opinion of their nature expressed by Virchow as substantially correct.

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* See p. 274, *supra*.

† GRIESINGER—*Beob. über die Krank. von Egypten: Dysenterie*, Archiv für Phys. Heilkunde, 1854, p. 546—"A clear yellowish-gray, serous fluid containing many clear yellow flocculi or a quantity of mucous lumps, whose abundant presence gave to the stools in a few cases an appearance like frogs' spawn. (Product of the follicular affections.)" BAMBERGER—*Ruhr*, in Virchow's Handbuch der Spec. Path. und Ther., Bd. VI, Abth. 1, 1855, S. 399—"Very early in the disease, little lumps of mucus resembling frogs' spawn or boiled sago grains appear in the stools."

‡ FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift, 1849, Bd. IV, S. 135. BAMBERGER and GRIESINGER, as cited in the last note. HEUBNER—*Ziemssen's Handbuch*, Bd. II, Th. 1, S. 531.

§ VIRCHOW—*Kriegstyphus und Ruhr*, Archiv, Bd. LII, 1871, S. 23. See also *Unterleibsaffectionen*, Archiv, Bd. V, 1853, S. 329.

‖ FRERICHS—*Die Verdauung*, in WAGNER'S Handwörterbuch der Phys., Bd. III, Abth. 1, Braunschweig, 1846, S. 804.

¶ See his paper last cited.

** HEUBNER—*Beiträge zur internen Kriegsmedicin*, Archiv der Heilkunde, XII, 1871, S. 429—"I have learned this view first from his late work (Kriegstyphus und Ruhr) and have therefore not tested this reaction in my own cases." HEUBNER does not appear to have known that this matter had been fully explained by VIRCHOW in 1853, (Archiv, Bd. V, 329,) although he might have found the reference to this passage in the article he cites.

†† J. H. SALISBURY—*Chronic Diarrhœa and its Complications*. Report of Surgeon General of Ohio for 1861, p. 31. See note to p. 373, *supra*.

Heubner makes another statement in connection with this subject which cannot be accepted without considerable modification. He speaks of the frogs'-spawn bodies as identical with the *corpora pinguia* of the ancients. It has been shown already* that certain varieties of the muco-purulent discharges of dysentery were supposed by the ancients to be fat; and it is possible that the frogs'-spawn bodies may have been similarly regarded by them, though explicit statements on the subject are wanting. It is, however, quite certain that a part at least of the so-called *corpora pinguia* were really fat. Whatever doubts may be felt as to the real nature of the bodies resembling "chopped tallow," which Aretæus† described as sometimes occurring in the dysenteric stools, there can be none as to those which were found to melt with heat, and to burn when thrown on live coals with a bright flame and characteristic odor, by Hollerius, Riverius, Tulpius and Stalpartius.‡

Numerous more modern observations have fully established the occasional occurrence of considerable quantities of fat in the stools. It occurs as a liquid oil, which may or may not solidify after it is voided, or in solid lumps of various sizes, which have been compared to bits of tallow or suet, scraps of candle-fat, adipocere, ambergris, &c. The term *corpora pinguia* more properly belongs to these solid lumps. A few writers, as Forestus, Pringle and Moseley,§ have spoken of their occurrence in dysentery; but almost all the individual cases I have found on record were examples of diarrhœa, and the form of flux in which these bodies occur in the stools may be conveniently designated by the term *diarrhœa adiposa* proposed by Sauvages.‖ Nevertheless a succinct account of the chief facts with regard to such discharges seems desirable in this place, on account of their occasional occurrence in dysentery also.

The origin of the fatty matters found in the stools has been variously explained. The earliest medical observers must have noticed that, in certain disordered conditions of the digestive processes, the fat of the food might pass unaltered through the alimentary canal and make its appearance unchanged in the dejecta. Both Philagrius and Galen alluded to this possibility¶ in a manner which shows that it was fully recognized by the old Greek physicians; but this simple explanation did not appear satisfactory to them in those cases in which the fatty matters passed differed in character from the fat taken with the food, or where it was supposed that the food had contained no fat. In these cases it was believed that the fat in the stools was derived from the adipose tissue of the body melted by the heat of the disease; the fat so melted might make its appearance either in the stools or the urine. In the case of dysentery, already alluded to, it was the fat of the intestines, of the mesentery, or some other abdominal fat that was melted. So also in certain diseases of the kidneys, the fat about these organs melted and appeared in the urine; but in certain fevers and other wasting diseases the fat of the whole body might undergo the same process and make its appearance either in the stools or the urine or both. This colliqua-

* *Supra*, p. 356.

† ARETÆUS—*De Causis et Signis Morb. Diut.*, Lib. II, Cap. 9, [Ed. Boerhaave, p. 69,]—in this passage the substances compared to chopped tallow are said to be white, thick and mucous, (μυξώδεα,) and to occur in those cases in which there are deep ulcers in the lower bowels. They must not be confounded with the large fleshy pieces which he also mentions—see note † page 361, *supra*.

‡ HOLLERIUS—*De Morb. Intern.*, Lib. I, Cap. 40, Scholia. For the other authors referred to, see notes below.

§ P. FORESTUS—*Obs. et Cur. Med.*, Lib. XXII, Obs. 33, Scholia, [Leyden Ed., 1596, p. 368,]—remarks that dysentery is still curable, even after fatty bodies ("quædam corpora pinguia") are excreted. PRINGLE—*Obs. on the Diseases of the Army*, Part III, Cap. 6, 7th Ed., London, 1774, p. 220.—says: "I do not know whether they are the same which Hippocrates calls σάρκες, (caruncuhæ:)" but in one case of a dysenteric patient who voided such substances he found they were bits of cheese, whether derived from cheese eaten a fortnight before, or formed in the intestinal canal from milk which had been used for diet by the sick man, he could not tell. He thinks that the corpora pinguia which he "had so often seen in the dysentery" must have been of the same nature. MOSELEY—*Treatise on Tropical Diseases*, 3d Edit., London, 1792, p. 234—says of this supposition that the corpora pinguia are identical with the caruncuhæ, "Certainly they are not;" and regards PRINGLE'S explanation of their nature as erroneous.

‖ SAUVAGES—*Nos. Meth.*, Amsterdam, 1768, T. II, p. 359. ¶ See next note.

tive condition, which was mentioned by Hippocrates and described by Philagrius, was fully discussed by Galen,* whose exposition was long accepted as satisfactory.

Felix Plater† emphasized the possibility of the derivation of fat in the stools from the food, and spoke of its occurrence as a variety of lientery, but did not reject the possible occurrence of colliquative melting. This latter supposed cause was, however, gradually lost sight of, and the source of the fat was sought for in the food alone by Riverius, Stalpartius‡ and most of the writers who have published cases, until the commencement of the present century, when Mérat,§ (1806,) misled by the resemblance of the fatty matters sometimes passed to adipocere, and confounding the latter with cholesterin, suggested the liver as their source.

A few years later Everard Home,‖ (1813,) who was also struck with the resemblance to adipocere, made this circumstance the basis of a suggestion that fat might be produced in the alimentary canal by the metamorphosis of the albuminoid matters of the food. He called attention to the production of ambergris in the intestine of the whale as a parallel case; and suggesting the bile as the agent by means of which the metamorphosis was effected, he adduced several experiments, performed at his instance by Brande, in which fat was produced from muscular tissue digested in bile out of the body at the temperature of 100° Fahr. This suggestion does not appear to have attracted much attention, but the view of Mérat, that the fat in these cases is an anomalous secretion of the liver, was supported by several subsequent writers, among whom Lloyd, Elliotson, (1833,) Reeves (1851) and Copland (1858)¶ may be particularly mentioned.

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* HIPPOCRATES—*Epidem.*, Lib. III, Sect. 3, § 17, [Ed. Littré, III, p. 105,]—describes a patient suffering from an ardent fever as having "oily urine" and "bilious, fatty stools," and—in *Prognostics*, § 12, [Ed. Littré, II, p. 143,]—observes that fatty matters resembling spiders' web swimming on the surface of the urine indicate colliquation, (ξύνταξις.) See also *Aphorism*, Sect. VII, 35, [Ed. Littré, IV, p. 587:] "When the scum on the surface is fatty and copious, it indicates acute disease of the kidneys." PHILAGRIUS—[Date uncertain; according to MANGETUS—*Biblioth. Med.*, T. II, p. 429, Geneva, 1731—he wrote 352 B. C.] in ÆTIUS, Tetr. II, Sermo I, Cap. 90, Lyon's Ed., 1549, p. 265—described, under the heading "De Colliquatione," a febrile condition in which there are offensive stools sometimes resembling bile, sometimes oily or fatty, and not derived from the food, but from the melting of the body. At first the newly formed fat is melted by the heat of the fever, afterwards the more solid flesh. The treatment should consist of cold external applications, cold drinks and cold foods, to diminish the heat of the body. PHILAGRIUS does not mention the appearance of fatty matters in the urine in this disease; but that symptom was fully discussed by GALEN—*Comm. III in Lib. III, Epidem.*, § 72, [Ed. Kühn, XVII, A, p. 737.]—where he suggests that in some cases the urine is not really oily, but only resembles oil, and *Comm. II in Lib. De Humor.*, § 25, [Ed. Kühn, XVI, p. 289.] in which he explains also that in diseases of the kidneys the fat around the kidneys may be melted and appear in the stools without general colliquative disease existing. The same view is expressed in *Comm. in Aph.*, Sect. VII, § 35, [Ed. Kühn, XVIII, A, p. 135.] In several places GALEN teaches that fat in the stools is only a sign of colliquation when the fat is not derived from the food; for example, in *Comm. I in Lib. De Humor.*, § 19, [Ed. Kühn, XVI, p. 188,] and *De Crisibus*, Lib. I, Cap. II, [Ed. Kühn, IX, p. 593.] His opinions on colliquation with fatty stools will be found in these passages and in *Comm. III in Lib. III, Epidem.*, § 55, [Ed. Kühn, XVII, A, p. 708.] For brief summaries of the views of the Greek physicians on this subject, consult GORRÆUS—*Def. Med.*, in Opera, Paris, 1622, p. 610, Article Ξύνταξις, Colliquatio; and SENNERTUS—*Pract. Med.*, Lib. IV, Cap. 15, Febres Colliquativæ, Opera, Paris, 1641, T. II, p. 750. After a glance at the rich literature (both ancient and modern) of the subject of fatty dejecta, it seems strange to read the remarks of GROSS—*Elements of Path. Anat.*, 2d Ed., Philada., 1845, p. 587—that "although this subject was incidentally noticed by some of the earlier physicians, as TULPIUS and FABRICIUS HILDANUS, it does not seem to have attracted the special attention of the profession until within a comparatively recent period." But what shall be said of the assertion of HABERSHON—*Diseases of the Abdomen*, 2d Ed., London, 1852, p. 371—that "the presence of fatty matters in the evacuations was first noticed by Dr. BRIGHT"!

† FELIX PLATER—*Praxeos, De Vitiis*, Lib. II, Cap. II, [Basel, 1736, T. III, p. 793.] He says that the dejections are sometimes fatty, resembling oil, butter or other kinds of fat; he has seen them resembling bits of candle-fat. "This dejection is a species of lientery when it proceeds from that which has been eaten, as often happens."

‡ See the cases by these authors cited in the note below.

§ F. V. MÉRAT—*Mémoire sur la Formation de l'Adipocire dans l'Homme vivant*, Mém. de la Soc. Méd. d'Émulation, an. VI, Paris, 1806, p. 460. He says that although in the cadaver all parts of the body may be turned into adipocere, the bile alone contains it in the living animal. Brain tissue or bile digested in alcohol, and then diluted with water, will throw down adipocere in transparent scales. In the liver it occurs in two forms, fatty liver and hepatic calculi; he found it abundant in the white stools of jaundice, and in the fatty stools of a man who died of heart disease. "The adipocere met with in the intestinal canal comes either from the liver or the gall-bladder." Among the causes which favor the development of adipocere in the liver, embarrassment of the respiration, as in phthisis and disease of the heart, plays an important part.

‖ SIR EVERARD HOME—*On the Formation of Fat in the Intestines of living Animals*, Phil. Trans., 1813, Part I, p. 146. Yet it may be remarked that, in one of the two cases communicated by BABINGTON, which his paper contains, the patient was taking olive oil in the dose of two or three ounces at a time, while in the other it is not thought necessary to mention the character of the ingesta.

¶ E. A. LLOYD—*Case of Jaundice with Discharge of Fatty Matter from the Bowels, and a Contracted State of the Duodenum*, Med. Chir. Trans., XVIII, 1833, p. 57—"we were led to infer that it was a morbid secretion of the liver," (p. 62.) JOHN ELLIOTSON—*On the Discharge of Fatty Matters from the Alimentary Canal and Urinary Passages*, Med. Chir. Trans., XVIII, 1833, p. 67; a collection of sixteen cases, of which five, viz: Nos. 9, 12, 13, 14 and 16 had not previously been published. He compares the fatty matters to ambergris, and suggests that their different consistence is simply due to their containing different proportions of elaine and stearine. "The pain at the epigastrium and right hypochondrium experienced in some cases, the jaundice sometimes noticed, the total deficiency of bile in the motions of some of the patients, and the unctuous nature of most biliary concretions,

Meanwhile Kuntzmann (1824) and Bright† (1832) had drawn attention to the existence of notable organic disease of the pancreas in the bodies of individuals who had suffered from fatty evacuations, and similar observations were published by Lloyd and Elliotson,‡ who, however, seem not to have appreciated their significance. These cases were cited by Claude Bernard (1849) and his student Moyse § in support of the theory, previously put forward by Eberle,‖ that the pancreatic juice is the efficient agent in the digestion of fats.

According to Bernard's presentation of this theory, the pancreatic juice has the power, which it alone of the digestive fluids enjoys, of forming an emulsion with the fats, which are absorbed from the intestinal canal in this emulsified condition. Any disease of the pancreas which modifies the quantity or quality of its secretion to such an extent that it is no longer capable of emulsifying the fats, will lead to their appearance undigested in the stools. Bernard succeeded in suspending the pancreatic secretion for a time in two dogs by injecting melted tallow into the pancreatic duct. Both animals passed large quantities of undigested fat in their stools and rapidly became emaciated, although their appetite was voracious. This result appeared to afford convincing experimental proof of the correctness of Bernard's theory of the function of the pancreas and his explanation of fatty discharges from the bowels. Accordingly this theory of the pancreatic function has been accepted by several able physiologists,* and the resulting explanation of fatty discharges has been adopted in various quarters.

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together with the natural presence of unctuous substances in the bile, may favour the opinion of their hepatic origin," (p. 84.) C. E. REEVES—*On the Presence of Fat in the Excretions*, Edinburgh Monthly Journ. of Med. Sci., XVIII, 1854, p. 201. This paper is particularly rich in references to the literature of the subject, and is the mine from which subsequent writers have borrowed most of their cases. The author discusses the presence of fat in the urine, in the fæces and in vomited matters, and concludes with regard to the fæces that "Fat, as a disease, must, I think, be looked upon as resulting from some change either in the bile itself or from the liver secreting it from the portal vein," (p. 204.) JAMES COPLAND—*Dict. of Pract. Med.*, Vol. I, London, 1858, p. 400; Art. *Intestinal Concretions*. COPLAND gives an explanation which recalls the views of the ancients: "It appears from the history of the cases on record, as well as from those recently observed by Dr. Elliotson and Mr. Lloyd, to be especially connected with disease of the assimilating viscera, and consequently with imperfect assimilation; a portion of the chyle, instead of being changed to healthy blood, assuming an oleaginous state, as not infrequently observed in the serum. The fatty matter thus accumulated in the blood, will, in several states of disease, be eliminated from it by excreting organs—particularly by the mucous surface of the bowels, and by the liver and kidneys—instead of being deposited in the adipose tissue for ulterior purposes," &c.

* KUNTZMANN—*Abgang reines Fettes durch den After*, Hufeland's Journal, LIII, 1821, St. I, S. 106, and LIX, 1824, St. 3, S. 45. The second paper gives the autopsy. A calculus was found in the cystic duct. The pancreas was hardened to a cartilaginous consistence, and was full of whitish, stony concretions of various sizes; its excretory duct was entirely closed. The author distinctly suggests the possibility that the absence of the pancreatic juice may have been the cause of the fatty discharges: "ob dieses durch den Mangel des pancreatischen Saftes bewirkt wurde," etc., (S. 51.) HUFELAND remarks, in a note to this second paper: "This disease, which I myself have also observed several times, represents a new sort of diarrhœa, and I propose to call it *Stearrhœa*." R. BRIGHT—*Cases and Observations connected with Disease of the Pancreas and Duodenum*, Med. Chir. Trans., XVIII, 1833, p. 1—reported three cases of fatty evacuations in which he found on the autopsy "disease probably malignant of that part of the pancreas, which is near to the duodenum; and ulceration of the duodenum itself," (p. 51.) In the same paper he reports a case (No. 6) in which there was scirrhus of the pancreas involving its duodenal extremity, but no discharge of fat. In this case there was no ulceration of the duodenum. He remarks: "I will not even affect to decide, whence the peculiar fatty matter is derived: whether it is to be considered as a vitiated secretion from natural structures, which must here be chiefly mucous membranes; or as a discharge from the diseased and ulcerated parts; or as the product of defective digestion of alimentary matter, depending on the imperfect supply or irregular admixture of the biliary and pancreatic or other secretions, or on the perverted and impeded action of the duodenum," (p. 52.)

† LLOYD'S case is that cited in the last note but one, and ELLIOTSON'S is case 12 in his paper cited in the same note.

‡ CLAUDE BERNARD'S earliest observations (which showed that the fat of the food first begins to be emulsified and absorbed at and below the point of entrance of the pancreatic duct, and therefore much lower in the rabbit than in the dog) were made during the winter of 1846 and communicated to the Academy of Sciences in 1849—*Recherches sur les usages du Suc Pancréatique*, Comptes Rendus, XXVIII, p. 283; see also XXX, pp. 210, 228. They will be found at length in his *Mémoire sur le Pancréas*, Paris, 1856. In this essay he repeats the cases collected by MOYSE (*vide infra*) and cites the case published by ALFRED CLARK (*vide infra*) and one observed by TREMBLAYE, (Recueil des Travaux de la Soc. Méd. d'Indre-et-Loire, 1852.) For his account of the successful experiments on the two dogs referred to in the text, see p. 99 *et seq.* D. MOYSE, *Étude historique et critique sur les Fonctions et les Maladies du Pancréas*, Paris Thesis, (170,) 1852. This essay contains six cases of fatty evacuations with autopsies, viz: BRIGHT'S three cases; LLOYD'S case; ELLIOTSON'S case 12, and a case observed by Drs. GOULD and J. B. S. JACKSON, of Boston, Mass., [see note ‡ to p. 381, *infra*.] MOYSE has been justly reproached with many inaccuracies in his transcript of these cases, [see Med. Chir. Review, July, 1853, p. 163,] which BERNARD, in copying them from him, has not corrected.

§ EBERLE—*Physiologie der Verdauung*, Würzburg, 1834, S. 251—showed by experiment that the pancreatic juice had the power of emulsifying the fats, and suggested this as its principal use in digestion.

‖ J. C. DALTON—*Human Physiology*, 6th Edit., Philadelphia, 1875, p. 175 *et seq.*, also p. 221. AUSTIN FLINT, JR.—*Physiol. of Man; Alimentation*, &c., New York, 1867, p. 342 *et seq.* FLINT cites the observations of BUSCH—*Beitrag zur Phys. der Verdauungsorgane*, Virchow's Archiv, XIV, 1858, S. 140 *et seq.*—as "conclusive" proof of BERNARD'S view that the fats are emulsified by the pancreatic juice alone. The case described by BUSCH was one of intestinal fistula. Fats swallowed appeared at the upper opening of the intestine emulsified; if injected into the lower end, the fats appeared unchanged in the fæces. To argue from this, as FLINT does, is a striking example of the *non sequitur*, since the facts prove as much for the bile as for the pancreatic juice; and I must note that FLINT himself admits elsewhere that "when the bile is diverted from the intestine, the proportion of fat in the chyle is greatly reduced, and a large proportion of the fat taken with the food passes through the intestine and is found in the fæces." (p. 373.)

But notwithstanding all the apparent array of evidence in its favor it would appear that this view of the question is entirely too exclusive. It is admitted on every side that the pancreas enjoys the power, which was attributed to it by Eberle and Bernard, of fitting the fats for absorption; but the investigations of Frerichs, Lenz, Bidder and Schmidt, Lehmann and Colin* would appear to show quite as positively that the emulsifying power of the pancreatic juice is shared by other digestive fluids, such as the intestinal juice, and especially the bile. It has also been shown that if the bile be diverted from the intestinal canal a large portion of the fat of the food passes through undigested and makes its appearance in the stools† very much as in the dogs whose pancreatic secretion was abolished in the ingenious experiments of Bernard.

Moreover, several cases have been reported in which fatty discharges have coexisted with clay-colored stools, jaundice, or both, but in which on the autopsy no pancreatic disease could be discovered.‡ Others are recorded in which extensive disease of the pancreas was found on the autopsy, although fatty stools had not occurred during life; § and even in most of those in which fatty discharges coexisted with disease of the pancreas, as shown by the autopsy, disease of the liver also has been shown to exist, both by the symptoms observed during life, such as clay-colored stools, jaundice or hepatic colic, and the lesions found after

* FRERICHS—Art. *Verdauung* in WAGNER'S *Handwörterbuch der Phys.*, III, Abth. 1, S. 847; E. LENZ—*De Adipis Concoctione et Absorptione*, Dorpat, 1850, p. 45 *et seq.*; BIDDER und SCHMIDT—*Die Verdauungssäfte*, Mitau und Leipzig, 1852, S. 246 *et seq.*; LEHMANN—*Phys. Chemistry*, Transl. of Cavendish Soc., Vol. II, London, 1853, p. 115; COLIN—*De la digestion et de l'absorption des matières grasses sans le concours du fluide pancréatique*, Bulletin de l'Acad. Imp. de Méd., XXII, 1856-7, p. 659. Consult also LONGET—*Traité de Phys.*, 2me Edit., T. I, Paris, 1861, p. 264, and CARPENTER—*Principles of Human Physiology*, 7th Ed., London, 1869, p. 139.

† Thus BIDDER und SCHMIDT [p. 221, *op. cit.*, in last note] found that in dogs with biliary fistulæ by far the largest part of the fat taken as food found its way into the stools. Their experiments are especially valuable, because the *quantity* of fat taken and passed during the time of the experiment was determined by chemical analysis.

‡ PEARSON'S case [No. 13 in ELLIOTSON'S paper, cited *supra* on p. 377] has been cited by EISENMANN [*vide* p. 381, *infra*,] and REEVES [*vide* p. 378, *supra*;] and the latter cites also the case of MÉRAT and three observed by PORTAL, of which, however, only two properly belong here. [See list of cases p. 381, *infra*.]

§ Besides the cases of this kind which have been recorded since the publication of the views of BERNARD, several observations may be cited in which it is not specially recorded that the stools were examined for fat and none found, but in which the full development of the adipose tissue of the body, mentioned in the account of the autopsies, shows that the fatty matters of the food must have been digested, and therefore that the existence of fatty diarrhœa during life cannot be assumed to have been overlooked. For example, J. G. GREISELIUS—*De Repentina Suavi Morte ex Pancreate Sphacelato*, Ephem. Germ., Dec. I, an. 3, 1672, Obs. 45; DE HAEN—*Opusc. Med. Phys.*, 1780, I, p. 217, [I cite from LONGET'S *Traité de Phys.*, 2mo Ed., T. I, Paris, 1861, p. 265.] J. ABERCROMBIE—*Diseases of the Pancreas*, Case XII, Edinburgh Med. and Surg. Journ., XXI, 1824, p. 242; the same case will be found in his *Diseases of the Stomach*, &c., Edinburgh, 1828, Case 143, p. 393; J. DAWIDOFF—*De Morbis Pancreatis Obs. quadam*, Dorpat, 1833, Obs. 2, p. 9; CASPER—*Einiges über den Krebs der Bauchspeicheldrüse*, Wochenschrift f. d. ges. Heilkunde, July, 1836, S. 429. According to LONGET (*loc. cit.*, *supra*) the thesis of BÉCOURT—*Rech. sur le Pancréas*, Strasbourg, 1830, contains several similar cases. To these I may add Case 6, in the paper of BRIGHT, [cited on p. 378, *supra*.] Since BERNARD'S views were published the stools have been examined for fat, but none found in a number of cases of disease of the pancreas. Two of these were reported by H. FEARNSIDE—*Illustrations of Pancreatic Disease*, London Med. Gazette, XI, 1850, p. 967. BERNARD has objected [p. 116, *Mémoire sur le Pancréas*, cited on p. 378, *supra*] that these were cases of acute disease of the pancreas, and that as patients do not usually eat fatty matters in acute diseases, these would not be likely to occur in the stools; I observe, however, that one of FEARNSIDE'S patients had been sick a year and the other two years, and am disposed to think with that gentleman that probably the "disease of the pancreas must have been long in progress." No such objection, however, can be made to such cases as the following, in which cancer of the pancreas was found on the autopsy, while the stools were vainly examined for fatty matters during life: D. R. HALDANE—*Cancer of the Pancreas*, Edinburgh Monthly Jour. of Med. Science, XIX, 1854, p. 77; J. S. BARTRUM—*Case of Scirrhus of the Pancreas and Stomach*, Association Med. Jour., 1855, p. 564; WILKS—*Colloid Cancer of the Pancreas*, Trans. of the Path. Soc. of London, VI, 1855, p. 224; J. M. DA COSTA—*Primary Cancer of the Pancreas*, Proc. of the Path. Soc. of Philadelphia, (1857.) Vol. I, 1860, p. 8; CRISP—*Scirrhus Enlargement of the Pancreas*, Trans. of the Path. Soc. of London, XIII, 1861-2, p. 124; WARD—*Two Cases of Cancerous Disease of the Pancreas*, The Lancet, July, 1863, p. 66; J. B. M. BESSON—*De Quelques Faits Path. pour servir à l'Étude du Pancréas*, Paris Thesis, 104, 1864—2 cases; S. W. GROSS—*Primary Cancer of the Head of the Pancreas*, (1869,) Proc. of the Path. Soc. of Phila., Vol. III, 1871, p. 94; C. B. NANCREDE—*Cancer of the Pancreas*, (1870,) *op. cit.*, Vol. III, p. 158; TARBELL—*Cancer of the Pancreas*, Boston Med. and Surg. Jour., June, 1872, p. 371. These cases might be multiplied if necessary, but the above are sufficient to illustrate the point under discussion. The number of cases of cancer or other chronic organic disease of the pancreas in which the record makes no statement as to the presence or absence of fat in the stools is quite large. Whatever other uses these incomplete observations may serve, it is not logical to appeal to them on either side of this question, for the possibility of oversight cannot be denied. Thus MEISSNER—*Ueber Krebs*, in SCHMIDT'S *Jahrb.*, 1873, Bd. 158, S. 30—cites four cases of cancer of the pancreas in which he says: "The early opinion that oily stools result from diseases of the pancreas was not corroborated. I note, however, that in one of these cases, that of WEBB, [see note, p. 381, *infra*.] oily stools did follow the use of fatty food, while in the three others the original record does not state whether the stools were fatty or not, viz: CHVOSTEK—Wien Med. Wochenschrift, XXII, June, 1872, p. 552; F. H. GROSS—Phil. Med. Times, June, 1872, p. 354, and LUTTHLEN—*Memorabilien*, XVII, 1872, 7, p. 399. The reader desirous of studying the general subject of cancer of the pancreas should consult the Thesis of ANCELET—*Essai sur l'Anat. Path. du Pancréas*, Paris Thesis, No. 274, 1856—which gives references to 171 cases of cancer of the pancreas in literature, besides 5 observed by the author; and the later work of the same author—*Études sur les Maladies du Pancréas*, Paris, 1864—in which the number of such cases is increased to 200, in five of which, only, fatty stools are recorded, (p. 74;) also the paper by Dr. J. M. DA COSTA—*Cancer of the Pancreas*, Proc. of the Path. Soc. of Philada., (1858,) Vol. I, 1860, p. 109—in which 37 cases of cancer of the pancreas are analysed, (with references.) I believe my notes in connection with this subject include all the cases referred to by these authors in which the presence or absence of fat in the stools is definitely noted.

death, such as cancer, gall-stones, obstruction of the common duct, distention of the biliary passages, and the like.*

A consideration of these circumstances would seem to indicate that disease of the liver may play an important part in the causation of fatty diarrhœa; but other observations can be brought forward to show that this symptom may occur during disorders in which the functions of digestion or absorption are impaired, although there is no recognizable disease of either the liver or pancreas. Thus Prout† observed fatty stools in a woman whose only abdominal disease was ulceration of the large intestine. Gull‡ saw them in the case of a child laboring under strumous disease of the mesenteric glands, in whom, on the autopsy, both the liver and the pancreas were found to be healthy. Bidie§ has described a species of acute diarrhœa occurring among soldiers in India, in which he found fatty bodies in the stools. Simon, Heinrich and Bouchardat‖ have called attention to the occurrence of fatty stools in patients suffering with diabetes mellitus. Heinrich observed the same condition in phthisis pulmonalis. Zimmermann¶ saw fatty concretions the size of beans, or larger, in the stools of typhoid fever. Lauder Lindsay observed both solid and fluid fat in the dejecta of cholera,** and Widerhofer†† asserts that fatty stools are of common occurrence in the chronic intestinal diseases of children, especially in intestinal tuberculosis.

It would appear, therefore, in a general way that any morbid condition which interferes either with the digestion or the absorption of the fatty matters of the food may be followed by the appearance of the undigested fat in the stools, if the patient continues to take the usual proportion of this substance in his food. Moreover, as has been shown by Ancelet,‡‡ if an excess of fat, beyond the digestive powers of the individual, be swallowed by a perfectly healthy person, the excess will be passed undigested with the stools. The occurrence of fatty dejections is therefore related on the one hand to the capability of the individual for digesting and absorbing fat, on the other to the quantity of fat ingested.

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* This happened in the cases reported by KUNTZMANN, BRIGHT, (3 cases,) LLOYD, ELLIOTSON'S case 12, EASTCOTT, GOULD and JACKSON, GREENE, the catalogue of St. Bartholomew's Hospital, CLARK, MARSTON, MARCET, HARLEY, ROQUES, SIMPSON, WEBB and BOWDITCH. [See list of cases on next page.] The only cases I have been able to find of fatty diarrhœa with disease of the pancreas, in which the liver was not evidently involved, are the case of TREMBLAYE, cited by BERNARD, and the case of SILVER. In the first there was no jaundice during life; the stools were dark colored; and on the autopsy the liver was found healthy, but there was chronic inflammation and thickening of the coats of the stomach and duodenum. In SILVER'S case there is no record of the condition of the liver or of any organ but the pancreas.

† PROUT—case 14 in ELLIOTSON'S paper, cited on p. 377, *supra*.

‡ GULL—see paper cited in list of cases, *infra*.

§ GEO. BIDIE—*Account of a Species of Diarrhœa, in which the Stools contain Fatty Corpuscles*, Edinburgh Med. Jour., III, 1857–8, p. 149.

‖ The coexistence of fatty stools with diabetes had previously been noted by various authors, as BRIGHT and ELLIOTSON, (in their papers cited *supra*.) SIMON—*Animal Chemistry*, Transl. of Syd. Soc., London, 1846, Vol. II, p. 377—analyzed the stools in a case of diabetes. The fæces amounted to 18.5 oz. daily, containing 2 oz. of fat. The patient was taking 2 oz. of cod-liver oil daily, besides meat and eggs, &c., the quantity of fat in the food not being determined. SIMON gives, in the same place, other analyses of the fæces of diabetes, the value of which is impaired by the fact, that although the percentages show an abnormal proportion of fat in the stools, yet neither the total quantity passed daily nor the quantity of fat in the food is stated. HEINRICH—*Fäcalmaterien in Krankheiten*, Haeser's Archiv, VI, 1844, p. 306—gives one case of diabetes and two of consumption with fat in the stools. See also BOUCHARDAT—*De la Pimélorrhée*, Annuaire de Thérapeutique, 1861, Supplement, p. 268. It has been suggested that an atrophy of the pancreas or diminution of its secretion occurs in these cases; and indeed in ELLIOTSON'S case [No. 12 in paper cited *supra*] the pancreas was shown to be diseased on the autopsy; but it must also be noted that a diminution in the secretion of the bile, as indicated by the clay-colored stools, is a prominent feature in most of these cases.

¶ G. ZIMMERMANN—*Eigenthümliche Concretionen in den Stühlen von Typhuskranken*, Deutsche Klinik, 1853, p. 278. This author noticed yellowish-white masses of various sizes in the stools of typhus (*i. e.*, typhoid) patients, and finally selected a case for more exact examination. In this case the concretions were rounded or oval, in size from that of beans to that of hazel-nuts or larger. On chemical examination they proved to consist largely of water, 1,000 parts giving only 237.8 of dry residue; of this 63 per cent. was composed of fat and fat acids, the rest of albuminates and inorganic matter. Under the microscope the author found, besides fat drops, cells and nuclei such as are usually observed in the intestinal contents. SIMON has described a somewhat similar concretion "resembling caseous matter" from a lady suffering from hepatic disorder—*Animal Chemistry*, Transl. of Syd. Soc., London, 1846, Vol. II, p. 385.

** W. LAUDER LINDSAY—*Cases of Cholera; illustrative of the Presence of Fat in the Fæces, &c.*, Edinburgh Monthly Jour. of Med. Sci., XIX, 1854, p. 125—"It thus appears that, in the four preceding cases, fatty matters were found in the fæces on seven different occasions. In five of these they occurred in a solid form, resembling pieces of tallow or suet; in two as a fluid oil." (p. 132.)

†† WIDERHOFER—*Semiotik des Unterleibes*, Jahrb. für Kinderheilkunde, IV, 1870–1, S. 261.

‡‡ E. ANCELET—*De l'Indigestion des Graisses*, Gaz. des Hôpitaux, 1860, pp. 463 and 466. An excellent article, in which the reader will find references to a great deal of the literature of the subject. ANCELET gave 100 grammes of olive oil to a healthy man. Three liquid stools resulted containing an oily substance. ELLIOTSON [paper cited *supra*] observes that castor oil given medicinally is frequently recognized in the stools.

Eisenmann* has revived the old belief that, in some of these cases, the quantity of fat passed is greater than the quantity ingested, and that it must, therefore, in some way be derived from the patient himself, and not merely from his food. He has brought forward once more the opinion of the ancients that the fat of the body may be reabsorbed and excreted from the intestines, and suggested also the possibility of a transformation in the alimentary canal of a part of the starch of the food into fat, as Everard Home† had thought possible in the case of the albuminoid matters. It must be confessed, however, that definite observations in support of any such opinion are wanting.

Whoever peruses the published cases of fatty stools, to which references are given in the foot-note,‡ will not fail to be struck with the absence of any precise determination either of the actual quantity of fatty matters passed, or of the quantity of fat ingested during the same time. In the majority of these cases the quantity of fatty matter passed appears to have been estimated almost as loosely as in one of the cases of Tulpius, who tells us that the amount passed during the patient's illness was so great that it would no doubt have filled several little vessels if any one had collected it; and in the few instances in which an estimate of the quantity passed daily has been recorded, it appears to have been only

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* EISENMANN—*Zur Path. des Pankreas*, Prager Vierteljahrschrift für die Prakt. Heilkunde, 1853, Bd. IV, S. 73. This writer, like MOYSE, was a student of BERNARD, and his essay contains abstracts of the same cases MOYSE collected, with the addition of the case of LUSSANA. [See list of cases below.] EISENMANN, however, was so far from accepting BERNARD'S view, that he gives a case of his own, in which no fatty matters were found in the stools, as an illustration of pancreatic disease. He cites the cases of PEARSON, (ELLIOTSON'S case 13,) SCOTT and TULPIUS, [see list of cases *infra*,] as instances in which the quantity of fat passed was greater than could probably have been derived from the food, and suggests that its origin may be either a transformation in the alimentary canal of a part of starchy articles of food into fat, or a reabsorption of the fat of the body and its subsequent excretion. BOUCHARDAT [in paper cited on the last page] also thinks the quantity of fat passed larger than could have been derived from the fat of the food, and thinks the excess is formed by the transformation of the feculent articles of diet. He tells us that in his case he diminished the amount of fat eaten by the patient as much as possible, and that the quantity of fat subsequently passed was greater than the amount of fat contained in the food taken. This appears, however, to be an entirely conjectural statement, as no figures are given.

† HOME—see paper cited on p. 377, *supra*.

‡ The following is a list of references to the cases of fatty diarrhœa which I have noticed—(in those marked with an * an autopsy is recorded:) FABR. HILDANUS—*Obs. Chir. Cent. IV, Obs.* 47; Opera, Frankfort, 1646, p. 321, *Matrona quædam multum pinguedinis per secessum excernit*; G. MORBIUS—*Fundament. Med. Physiol. Cap. XI*, Jena, 1661, p. 226; L. RIVERIUS—*Obs. Med. Cent. II, Obs.* 23, *Pinguia corpuscula per alvum excreta*, Opera, Lyons, 1679, p. 499; TULPIUS—*Obs. Med. Lib. III, Cap.* 18, *Adeps cottidie ab alvo prodiens*; also *Cap.* 19, *Idem adeps, ab alvo, ac vesica*, Amsterdam, 1652, pp. 216 and 218; MŒLLENBROCCUS—*Fluxus alvi pinguis*, Ephem. German. Dec. I, an. 2, 1671, Obs. 20; LENTILIUS—*Globuli pingues butyracei per infantum alvum magnis cum torminibus ejecti*, Ephem. German. Dec. II, an. 2, 1683, Obs. 152; SIGISMOND—Jour. Méd. de Laroque, Feb., 1683, [I cite from Mérat; *vide infra*;] STALPARTIUS—*Varii pinguiores, viridesque globuli per alvum excreti*, Obs. Rar. Cent. I, Obs. 61, Leyden, 1687, p. 253; CLAUDERUS—(one case) Ephem. German. Dec. II, an. 7, 1688, Obs. 183, Scholium; J. A. HÜNERWOLFFIUS—*De alvi excretione sebacea*, Ephem. German. Dec. II, an. 10, 1691, Obs. 51; T. ARNOT—*Fatty substances voided by stool, after a violent strain of the back*, Med. Essays and Obs. by a Soc. in Edinburgh, V, Part 2, 1744, p. 652; WM. SCOTT—*Fatty substances voided by stool*, Med. and Phil. Comment. by a Soc. in Edinburgh, IV, Part I, 1776, p. 334; MOLLERAT—*Maladie Singuliere*, Jour. de Méd., T. 48, 1777, p. 114; M. F. GEUDER—*Diatriba de Fermentis*, Sect. II, Cap. 2, Amsterdam, 1689, p. 107. This case is also cited by HALLER—*Element. Phys.*, Lib. XXIII, Sect. 3, § 32, [Lausanne, 1777, VI, p. 393;] F. V. MÉRAT—*Obs. sur une lésion organique du cœur*, &c., Jour. de Méd., T. VI, 1803, p. 387. This case is repeated in the *Mémoire* cited above, [note ; to p. 377, *supra*,] and a second case added in which four or five ounces of adipocere-like matter were found in the contents of the stomach and intestines after death. A. PORTAL*—*Maladies du Foie*, Paris, 1813, Part II, Art. 8, Obs. G and H, p. 419 *et seq.*; REEVES, in the paper cited above, [note * to p. 377, *supra*] quotes also Obs. I, p. 426, which appears to have been an ordinary case of gall-stones; WM. BABINGTON—two cases in the paper of EVERARD HOME, cited above, [note ‖ to p. 377, *supra*;] J. HOWSHIP—*Pract. Obs. in Surg. and Morb. Anat.*, London, 1816, p. 288, case 84, *Peculiar secretion from the intestines*; JAMES KENNEDY—*An account of a morbid concretion*, &c., *closely resembling ambergris*, Med. Chir. Jour. and Review, Vol. IV, 1817, p. 177. It seems probable, from the results of the examination of this concretion by Dr. URE, that it was a large gall-stone of cholesterine. KUNTZMANN—in papers cited above, [note * to p. 378, *supra*;] BRIGHT*—three cases in papers cited above, [note * to p. 378, *supra*;] E. A. LLOYD*—*Case of Jaundice with discharge of fatty matter from the bowels, and a contracted state of the duodenum*, Med. Chir. Trans., XVIII, 1833, p. 57; ELLIOTSON—in paper cited above, [note ¶ to p. 377, *supra*,] five new cases, viz: Nos. 9, 12*, 13*, 14*, 16; R. D. EASTCOTT*—*Fatty discharge from the bowels*, Lond. Med. Gaz., XII, 1833, p. 49; SCHNEIDER—Schmidt's Jahrb., XI, 1836, S. 325; SIMON—*op. cit., supra*, on p. 380, four cases of diabetes with fat in stools; HEINRICH—*op. cit., supra*, on p. 380, one case of diabetes and two of phthisis with fat in stools; A. A. GOULD and J. B. S. JACKSON,* see S. D. GROSS—*Elements of Path. Anat.*, (1839:) I cite 2d Ed., Philada., 1845, p. 589; see also *Catalogue of the Museum of the Boston Soc. for Med. Improvement*, 1847, No. 576, p. 174; GREENE*—*Malignant deposition involving the head of the pancreas and occupying the mesenteric glands, &c., oil in the fæces*, Dublin Quarterly Jour. of Med. Sci., Vol. I, 1846, p. 250; *Catalogue of the Anat. Museum of St. Bartholomew's Hospital*, Vol. I, London, 1846, p. 317—"Diseases of the pancreas," No. 2*; F. LUSSANA—*Pancreatitide*, Gazzetta Med. Ital., Lombardia, 1851, No. 28, p. 237; A. CLARK*—*Case of disease of the pancreas and liver, accompanied with fatty discharge from the bowels*, The Lancet, 1851, II, p. 152; TREMBLAYE*—Rec. des Travaux de la Soc. Méd. d'Indre-et-Loire, 1852; I quote from BERNARD'S *Mémoire sur le Pancréas*, [*vide* note ; to p. 378, *supra*;] J. A. MARSTON*—*Case of diarrhœa adiposa*, Glasgow Med. Jour., Vol. I, 1853-4, p. 301; W. L. WELLS—*On fatty alvine evacuations*, New York Med. Times, III, 1854, p. 153; WM. GULL*—*Fatty stools from disease of the mesenteric glands*, Guy's Hosp. Reports, I, 1855, p. 369; ROQUES*—*Cancer de la tête du pancréas*, Bull. de la Soc. Anat., 1857, p. 245; BOUCHARDAT—*op. cit., supra*, on p. 380, case of diabetes with fatty stools; MARCET*—*Fatty matters of human excrements in disease*, Med. Times and Gazette, Jan., 1858, p. 22; GEO. HARLEY*—*Jaundice, its Pathology and Treatment*, London, 1863, p. 71 *et seq.*; J. H. GIBSON—*Case of diarrhœa adiposa*, Trans. of the Amer. Med. Ass., XIV, 1864, p. 171; SIMPSON*—*Fatty discharge from the bowels*, The British Med. Journal, II, 1865, p. 2[illegible]; LANGDON DOWN—*Case of fatty diarrhœa treated by pancreatic extract*, Trans. of the Clinical Soc. of London, II, 1869, p. 119; ALEXANDER SILVER*—*Fatty degeneration of the pancreas*, Trans. of the Path. Soc. of London, XXIV, 1873, p. 121. In this case the condition of the liver and other organs is not recorded. W. H. WEBB*—*Scirrhus of the head of the pancreas*, Philada. Med. Times, Dec., 1871, p. 86. In this case fatty stools occurred twice

an estimate, and sometimes the estimate of the patient rather than of the physician.* In none of the cases does the quantity appear too great to have been derived from the food, and until some case is produced in which exact determinations of the quantity swallowed and voided by stool show that the latter is really greater than the former, there seems no ground for believing that such fatty discharges have any other source than the food.

Nor has the chemical analysis of the fat discharged in these cases produced any facts incompatible with this view. So long as this examination went no further than melting and burning the substance investigated, the peculiarities of color and consistence observed in some of the cases might seem to warrant the supposition that a new form of fat had been produced unlike the fat of the food; but the more modern analyses by Brande, Bergemann, Prout, Zimmermann, Simon and Marcet,† of the fatty matters passed in similar cases, would seem to show that they possess no characters which cannot be accounted for by a consideration of the various kinds of fat ingested, and of the admixtures and partial decompositions to which it is subjected in the alimentary canal.

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when fatty food was given. BOWDITCH*—*Fatty dejections for four years; Cancerous disease of the pancreas and liver*, Boston Med. and Surg. Journal, July, 1872, p. 65. In this case the patient had "used much fatty food" by the advice of her physician. She was ordered to avoid fat, and the stools "became copious, rather dark, with small masses of white substance merely, but no positive fat." To the foregoing I may add the following from catalogues of museums: *Catalogue of Anat. Mus. Univ. of Edinburgh*, 1831, p. 73, "I, 119—A quantity of substance resembling spermaceti, passed by a female who had a concretion in colon. Stearrhœa?" I, 123—Same description. *Catalogue of the Warren Anat. Mus.*, by J. B. S. JACKSON, Boston, 1870, p. 488, No. 2330—"Fat, discharged from the bowels of a man æt. 45," &c.; case of Dr. H. K. Oliver. *Path. Catalogue of the Museum of Guy's Hospital—Organs of Digestion*, London, 1857, p. 76, "1893[50]—Numerous masses of fat observed in the evacuation of a patient who suffered from jaundice. Patient under Dr. Bright's care in Job ward. John W., 1835, 1835," p. 115, "1989[50]—Cancer of the pancreas. A case of fatty stools. Mary G." These two cases were observed by Dr. BRIGHT subsequently to the three cited above.

* Of the cases cited by EISENMANN [see note * to p. 381, *supra*] as examples of a greater quantity of fat discharged than could have been derived from the food, that of TULPIUS has been disposed of in the text; in PEARSON'S case [No. 13 of ELLIOTSON'S paper cited on p. 377, *supra*] the quantity passed is stated to have been 2½ oz. of fat and a third of an ounce of oil daily; in SCOTT'S case [see last note] it is simply stated that "fatty substances, in great numbers, about the size of nuts, beans, pease, &c.," were passed. GRISCOM [p. 180 of paper cited in the last note] alludes to a case in which thirty pounds of fat were vomited in the course of a single day, in support of the same view. This is the case reported by GIOVANNI PASQUALI—*Descrizione di un vomito copiosissimo di adipe e sangue*, Annali Universali, XXXVII, Milan, 1826, p. 49—an abstract of which will be found in Johnson's Med. Chir. Rev., July, 1836, p. 247, and in the papers of ELLIOTSON and REEVES, [cited *supra*;] but it may be remarked that in this case the author does not state that thirty pounds of fatty matter were vomited, but this quantity, which was estimated, is affirmed of the total quantity of fluid vomited, including blood, &c. How much of this was fat is not stated. The attack came on after eating to excess; but what was eaten on this particular occasion is not specified, though we are informed the patient was in the habit of feasting during the day and at night, eating hastily large quantities of cold pudding, beans, pork-sausage and salad, (the latter with oil, of course.) In this connection, also, I may refer to the case of HOWSHIP, [see previous note,] in which we are told that "an astonishing quantity" of fat was passed; but as this was the consequence of taking "as much as a pint" of olive oil, it is not surprising. In another case of PEARSON'S [No. 16 in ELLIOTSON'S paper] it is stated that the quantity of fatty matter passed averaged about an ounce and a half daily. In the case reported by HILDANUS [see last note] it is affirmed that the woman discharged above three pounds of fat; but this was during the whole attack, and supposing the quantity to have been exactly determined, there is nothing to show how long it had been in accumulating. In one of BABINGTON'S cases [reported in E. HOME'S paper, see last note] a girl 4½ years old voided from one to three ounces of fat at intervals of 10 or 14 days. In GOULD and JACKSON'S case [see last note] the quantity is stated to have been on an average half a pound daily for six weeks; but this is merely the statement of the patient, who asserted also that he had no discharge of fat except after eating meat or articles cooked in fat; this we are gravely told his wife contradicted. In CLARK'S case [see last note] the quantity passed was usually "about three or four ounces daily, as nearly as we could guess.' The greatest quantity on any day "must have amounted to eight or nine ounces." In the case of WELLS [see last note] the quantity was estimated at three gills daily, and in GRISCOM'S case [see last note] about 2½ oz. daily. In none of these cases was it thought worth while to attempt to determine the quantity of butter and other fats ingested, and yet this is the key to the interpretation of such cases. The daily quantity of fat required as food by a male adult, 5 ft. 6 in. to 5 ft. 10 in. in height and weighing 140–160 pounds, is estimated by MOLESCHOTT [I quote from PARKES' *Hygiene*, 3d Ed., London, 1869, p. 163] at about three [2.964] ounces; but this it is well known far understates the actual consumption in many cases. It must be added that most of the cases are also open to the suspicion that, in estimating the quantity, other substances than fat were included; in some of them it is even possible that what was supposed to be fat may have been of an entirely different nature; thus CHAMBERS—*Digestion and its Derangements*, Amer. Ed., New York, 1856, p. 129—tells us that "one example, which has been preserved with great care in the museum of the College of Physicians, turned out, when the museum was put to rights in 1850, not to be fat at all. In fact, microscopic examination showed it to be muscular fibre—a lump of meat washed white in its passage through the bowels of a dyspeptic patient."

† BRANDE [in EVERARD HOME'S paper cited on p. 377, *supra*] examined the translucent wax-like globules, varying in size from that of a pea to that of a grape, which were passed in one of BABINGTON'S cases, and found that they were composed of "olive oil combined with mucus: the latter separated during putrefaction, and the oil was evolved, apparently unaltered." BERGEMANN made a very thorough examination of the fat passed in KUNTZMANN'S case, [cited above on p. 378.] He found it composed of two kinds of fat; one solid at the ordinary temperature of the air (stearine) which, after FOURCROY, he calls adipocere (also Fettstoff) and a fluid oil, (oleine.) When the fatty matter was dissolved in hot alcohol it formed a yellow solution from which the stearine separated on cooling. The proportion of the two substances was very similar to what exists in beef marrow. PROUT examined the fatty matter in several of ELLIOTSON'S cases, [see p. 83 of paper cited *supra*,] and it was doubtless under his inspiration that the latter wrote: "Chemists consider that animal oils are composed of two substances, the one solid and called Stearine, the other fluid and called Elaine, the various proportions of which to each other occasion the different consistence of different oily matters. Upon this diversity of their proportion, therefore, must, I presume, depend the diversity in the consistence of these discharges." In ZIMMERMANN'S analysis of the fatty bodies passed in typhoid fever [see paper cited on p. 380, *supra*] he found margarine. SIMON—*Animal Chem.*, Transl. of Syd. Soc. of London, 1846, II, 386—found margarine, combined with oleine, butyrin and their acids, in a fatty lump passed by a lady who was suffering from bilious sensations. MARCET [paper cited in list of cases *supra*] found bistearate of soda, oleic and margaric acids in the discharges of a patient in whom there was malignant disease of the pancreas, which "apparently so compressed the duct of the gall-bladder that no bile could flow into the intestines." He explains the presence of these bodies by the exclusion from the intestines of the alkaline bile and pancreatic juice, so that "the fatty acids contained in the alimentary canal could not be neutralised."

Monti* has demonstrated the abundant presence of fatty matters in the normal stools of sucking infants, its source being simply the milk which has escaped complete digestion, and there can be no doubt that in dysenteric and typhoid patients, supported on a milk diet, it sometimes happens that the quantity administered is greater than the enfeebled digestive organs can dispose of, and that various forms of fatty matters in the stools, among others fatty concretions of various sizes and consistence, are occasionally derived from this source. I have, myself, several times observed a characteristic form of such concretions in dysenteric patients nourished on milk, especially in chronic cases. These concretions are whitish or yellowish-white internally and of a somewhat cheesy consistence. Externally they are apt to be greenish or brownish, except when the stools are devoid of bile pigment; they melt and burn like fat, but on chemical examination usually prove to have a substratum of coagulated casein in which the fat molecules from the milk are entangled.†

THE TORMINA AND TENESMUS.—The tormina, or griping pains, which accompany dysentery are due to spasmodic contractions of the muscular coat of the inflamed intestines. In their general character, and especially in the circumstance that they come on in paroxysms, with intervals of ease between, these pains resemble those produced by the spasmodic contraction of other layers of non-striated muscular tissue, as, for example, the paroxysms of hepatic and nephritic colic and the uterine pains of labor. The normal peristaltic contractions of the intestinal muscular coat take place without consciousness, but unnaturally violent contractions become painful in proportion to their violence, even when the coats of the intestine are quite healthy, as is well illustrated by the gripings of flatulent colic. Whether in dysentery the inflamed condition of the intestine merely serves to determine violent contractions of the muscular coat, or whether, besides, the sensibilities of the inflamed intestine are abnormally excited, as in the case of external inflammations, so that a given degree of intestinal contraction produces greater pain than it would do if the intestine were not inflamed, is a matter of some uncertainty, but analogy seems to favor the latter view.

The seat of the painful contractions is very generally some part of the colon. Painful contractions of the small intestine, especially of the ileum, are, however, common enough. When the griping has its seat in the colon, it is very apt to be promptly followed by the stool which gives it temporary relief. When it has its seat in the small intestine, it seems reasonable to suppose that some little time would elapse before the stool should follow. The Greek physicians,‡ therefore, believed that the seat of the pain, and the time which elapsed before it was followed by a stool, were symptoms of importance in diagnosticating the part of the intestine which was ulcerated in dysentery. If the pain were at the umbilicus or above it, and if some time elapsed before it was followed by a stool, it showed that the small intestine was ulcerated. If the pain were lower down and promptly followed by

* MONTI—*Ueber die Veränderungen der Dejectionen im Säuglingsalter, etc.*, Jahrb. für Kinderheilkunde, Bd. I. N. F. 1867-8, S. 290. This author, whose statements on this subject I have several times been able to confirm, finds the normal stools of sucking infants constantly contain flocculi of coagulated casein and molecular fat from the milk, (Milchdetritus.) He gives a simple chemical method for these examinations.

† I may add that I have several times seen very similar masses, sometimes of considerable size, vomited by typhoid and dysenteric patients on milk diet; that I strongly incline to the opinion that the presence of an abnormal quantity of fat in the stools is far more common than has generally been supposed, and that I am disposed to believe that the views expressed by the intelligent reviewer of Dr. BRIGHT'S paper are substantially correct. See Med. Chir. Review, XX, 1834, p. 9: "From no very limited field of experience, we can safely say that the phenomena in question—the fatty substances in the evacuations, so far from being a rare, are, on the contrary, a very common occurrence or symptom, in disordered states of the alimentary canal. There is scarcely a day in the week, on which these "fatty substances" are not brought to us by patients, in bottles or in cups, as strange phenomena, and not less terrifying than strange—to them."

‡ This doctrine was most clearly set forth by ALEXANDER of TRALLES. See note † to p. 372, *supra*.

a stool, the ulceration was seated in the large intestine. Both these symptoms, however, so far as they possess any real significance, would point to the seat of the spasmodic contraction or griping, rather than to the seat of the ulceration. Thus, in typhoid fever with extensive ulceration of the small intestine, a catarrh of the colon may coexist accompanied, even if the colon is not ulcerated at all, by spasmodic contractions of its muscular coat promptly followed by stools. But in view of the varying position of the transverse colon, and especially in view of its frequent displacements in dysentery, it is also evident that pain arising from spasm of its muscular coat may be referred either to the umbilical region, or above, or below it. Moreover, the occurrence of a stool sooner or later after the griping pain must depend not only on the seat of the griping and its intensity, but also on the quantity and character of the intestinal contents. It is therefore clear that no very positive indications can be drawn from the considerations indicated.

With the tormina a certain degree of tenderness on pressure along the track of the colon is often associated. This is usually of a moderate character, but often sufficient to enable the physician to determine the position of the transverse colon with considerable certainty, and thus occasionally to recognize during life those displacements of the transverse colon downward which have been described by Annesley.* A high degree of tenderness usually indicates peritonitis, and may be limited to a single spot, or widely diffused in accordance with the extent of the peritoneal affection.

The *tenesmus* has already been commented upon † and its diagnostic value discussed. It consists essentially in an exaggeration of the reflex expulsive efforts by which the bowels are normally evacuated; and is painful in proportion to the violence of the contractions to which the muscles are goaded. In the healthy state these reflex expulsive efforts are conditioned by the accumulation of a certain quantity of fæcal matter in the sigmoid flexure and rectum; but when the mucous membrane of these parts is inflamed, its irritability is increased to such a point that the stimulus of a very small quantity of the altered intestinal contents is sufficient to provoke violent efforts. Moreover, since these morbid excretions are in a condition of intense molecular movement, (commencing putrefaction,) they undoubtedly possess acrid irritating properties, as is well illustrated by the readiness with which they produce excoriations of the skin about the anus, and this circumstance must add to their capacity for provoking intense expulsive efforts.

Towards the close of fatal cases it frequently happens that the irritability of the expulsive muscles becomes quite exhausted, so that these painful efforts are no longer possible. And for a similar reason, or because the muscular coat of the diseased intestine becomes paralyzed, as the sphincter ani often does during the last few days of the disease, the tormina cease. Baglivi‡ supposed this cessation of pain to result from mortification of the bowel, and therefore to be a fatal symptom. Undoubtedly cessation of pain in the last stage of the dysenteric collapse is usually a precursor of death; but the notion that it necessarily depends on sphacelus of the intestines is not supported by pathological anatomy. With the tenesmus a burning sensation in the anus, a sense of weight and dragging in the pelvis, and a dull aching pain in the sacral region are very frequently associated.

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*JAMES ANNESLEY—*Diseases of India*, London, 1828, Vol. II. p. 89, Chap. 3, Sect. 3, Sub-sect. 1—"Of Elongation and unnatural Positions of the Colon." See also Plates 14, 15, 23, 24, 25, 26, 27, 28, 29 and 30 of this work.

† Pages 337-8, *supra*.

‡ G. BAGLIVI—*De Prax. Med.*, Lib. I, Cap. IX. Lyons, 1699, p. 77—"Those who die of dysentery, almost all die from sphacelus of the intestines. It appears at least three days before death; the extremities begin to grow cold, the pulse is slow and inequal, thirst is no longer urgent, nor is there pain in the affected place; and some a few hours before death sink into delirium."

Prolapsus Ani and Perineal Abscess.—The intense expulsive efforts very frequently induce more or less prolapsus ani;* and this not merely in children, among whom it undoubtedly occurs most readily, but also in adults. There are no means of ascertaining the frequency of this complication during the late war,† but it was frequently mentioned by those who had the treatment of dysenteries under their direction. No case was reported during the war in which the protruded part sloughed off, an accident which has been known to occur in some rare instances.‡ Occasionally, by the extension of the inflammation from the rectum to the surrounding areolar tissue, periproctitic, or perineal abscesses are developed in dysentery, and this is probably most likely to occur in patients who have previously suffered from hæmorrhoids. In diphtheritic dysentery such abscesses may take on a gangrenous character, and extensive sloughing of the perinæum may occur before death;§ occasionally such abscesses give rise to fistula in ano.

Strangury and Vesical Tenesmus.—The occurrence of strangury during the progress of dysentery is mentioned by Hippocrates‖ in his account of the epidemics of the island of Thasus, and this complication has attracted the attention of the majority of writers on dysentery since his time. It results on the one hand from the concentrated character of the urine, which is generally scanty, of high specific gravity and decidedly acid reaction, and on the other hand from a hyperæmia or actual inflammation of the vesical mucous membrane, especially in the vicinity of the neck of the bladder. In the first condition the urine acts as an irritant to the morbidly sensitive mucous membrane and provokes violent vesical expulsive efforts, a true vesical tenesmus, or spasmodic contractions of the vesical sphincter, which may even determine retention of urine and require catheterization for its relief. Vesical hyperæmia or inflammation, when it occurs, appears to depend primarily on extension by continuity from the rectum, which is favored by the peculiar arrangement of the hæmorrhoidal and vesical bloodvessels.¶ Once established, the inflammation may pursue an independent course, and may even progress beyond the bladder, involving the mucous membrane of the ureters as far as the pelves of the kidneys.**

The milder degrees of vesical catarrh are indicated by an increase in the quantity of mucus in the urine, accompanied by the appearance of a few corpuscles resembling the white corpuscles of the blood, (mucous corpuscles.) When it acquires greater intensity, a stringy mucus or muco-pus comparatively rich in corpuscles is passed, or the mucus may

* This complication of intestinal fluxes was known in the Hippocratic era; see *Prorrhetics*, Lib. II, § 23, [Ed. Littré, IX, p. 55,] where it is said to occur in those who, having hæmorrhoids, are seized with diarrhœa, in children who suffer from chronic dysentery, and in certain old persons.

† In the new form of sick report adopted for our army in 1862, Prolapsus Ani did not appear, the cases being embraced under the head of others of this order, Digestive Organs. This change, however, is of very little moment for the purposes of the present inquiry, since the cases of prolapsus ani, reported as such on the sick report, are not usually dysenteric, but due to other diseases, as hæmorrhoids, &c. Thus, in Table C, Vol. I, Med. Hist., p. 638, 366 cases of prolapsus ani are reported without any deaths; and it appears from Table CI, p. 647, and Table CXII, p. 717, that prolapsus ani was alleged as the cause of discharge from the service in the case of 325 white and 7 colored soldiers.

‡ Such a case will be found in the Philadelphia Med. Museum, Vol. IV, 1807-8, p. 55—*Case of Prolapsus of the Colon, terminating in Death. With the appearances on dissection;* By Dr. Wm. Runkel. A laborer, aged 23, "had for some days laboured under a diarrhœa, accompanied with tenesmus." "A few hours before I saw him, the colon had come down to the length of nine or ten inches: and by the time I saw him, it was in a high state of inflammation and swelling; there being no possibility of reducing it, I ordered," etc., etc. "On, or about the eighth day, some part of the colon became sphacelated, and on the tenth sloughed off, a small ragged part remaining. The part that had come away, measured 21 inches in length." The patient died on the 17th day. On the autopsy he found "the arch of the colon very much distended, and also in a high state of inflammation; and an abscess in the coats of the rectum, with some sphacelation in the lower part of the colon." Compare note § to page 362, *supra*.

§ In particular I recall the case of a gentleman, 62 years of age, who died of diphtheritic dysentery in the fifth week of the disease, in the year 1870. In this case a sloughing abscess made its appearance on the left side of the anus about ten days before death, and formed ultimately, by the partial separations of the sloughs, a cavity large enough to receive an egg. The surface of the gangrenous patch extended upon the left buttock, and was as large as the palm of a man's hand. The patient, who was a large man and otherwise in robust health when taken sick, had long been a martyr to hæmorrhoids. Annesley—*Diseases of India*, London, 1828, Vol. II, pp. 292 and 291—mentions prolapsus ani as a troublesome symptom in dysentery and speaks of the occasional formation of abscesses in the vicinity of the anus.

‖ *Epidem.*, Lib. I, Sec. 2, [Ed. Littré, II, p. 619.] See also Cælius Aurelianus, *Morb. Chron.*, Lib. IV, Cap. 6, [Amman's Ed., p. 554.]

¶ See the account of the hæmorrhoidal and vesico-prostatic plexus of veins in Gray's *Anat.*, 2d Amer. Edit., Philada., 1862, p. 475.

** Finger—*Die epidemische Ruhr*, Prager Vierteljahrschrift für die prakt. Heilkunde, IV, 1849, S. 141.

disappear and be replaced by pus, which collects as a sediment when the urine is allowed to stand; but these more intense vesical inflammations are comparatively infrequent.

Vesical tenesmus or strangury may accompany any case of dysentery, whether mild or severe. In some epidemics, indeed, they have been known to occur to the extent of suppression of urine in every case;* but usually the intensity of the vesical symptoms bears some relation to the severity of the dysentery, and hence they are more apt to be troublesome in the diphtheritic form of the disease, while the milder forms of simple inflammatory dysentery sometimes escape the vesical complication altogether. These symptoms may occur at any time after the dysentery is fully established. The latter part of the first week is a common period for their appearance, which, however, may be postponed to the second or the third week, or even later. When mild they often yield promptly to remedies which dilute the urinary secretion and render it less acid; in the severer cases they often persist until convalescence or the final collapse. The same continuity of tissue which favors the development of vesical inflammation in men may give rise in women to catarrhal or even diphtheritic inflammations of the vaginal and uterine mucous membrane.†

The Urine.—As already mentioned, the urine is usually scanty and preternaturally acid. The first circumstance often determines a sediment of urates when it cools; the latter produces the formation of crystals of free uric acid. The occasional presence of mucus, muco-pus and pus from the inflamed mucous membrane of the urinary passages has also been noted. No other abnormities are generally encountered. Albumen is sometimes observed in the urine in intense diphtheritic cases, as occurs also in diphtheria of the throat,‡ but usually when albumen occurs in the urine of a patient suffering from acute dysentery it will be found that he has previously presented symptoms of chronic kidney disease.

Treitz,§ in his essay on the intestinal affections that occur in chronic kidney disease, from the irritant action of the carbonate of ammonia formed in the intestine by the decomposition of urea, which, when the kidneys fail to act is excreted by the intestinal mucous membrane, has suggested that this condition is probably a frequent cause of dysentery, and that, especially in those cases which practitioners ascribe to catching cold, it may be supposed that some affection of the kidneys is the primary lesion. This supposition, which is a purely speculative one, has been sharply criticised by Zimmermann,‖ who,

* See Report of Assistant Surgeon E. Coues, *supra*, p. 63, where this statement is made of the dysenteric cases which occurred at Columbia, S. C., in the fall of 1868.

† Finger, p. 141, *op. cit.*, on last page.

‡ Heubner—in *Archiv der Heilkunde*, XII, 1871, S. 436—states that he did not find albumen in a single one of his cases at Leipsic; but it must be noted that no severe diphtheritic cases occurred among them.

§ Treitz—*Ueber urämische Darmaffectionen*, Prager Vierteljahrschrift, Bd. 64, 1859, S. 143—after describing these lesions in extenso, remarks: "Having been convinced of these facts, the suspicion is aroused that in other forms of dysentery also, especially those which the practitioner willingly ascribes to catching cold, we have to do in the first place with disease of the kidneys. Also, in the epidemic occurrence of dysentery, attention should be directed first of all to the urinary functions. I remember right well some details of the dysentery epidemic which prevailed in Prague in the years 1846 and 1847. Cases were then seen in which the disease ended fatally within three days in the strongest individuals, and in which the common appearances of inflammatory dysentery were not encountered, but sloughing, gangrene and perforation of the intestinal coats quite in the manner in which they occur sporadically in Bright's disease," (p. 195.)

‖ G. Zimmermann (Stabsarzt)—*Zur Lehre vom dysenterischen Process, namentlich über die Betheiligung der Nieren an demselben*, Deutsche Klinik, 1860, S. 407, 415, 426 u. 438—divides dysentery, in accordance with the condition of the kidneys, into four categories. In the first, comprehending the great majority of the cases which terminate in recovery, there is no kidney complication. In the second group of cases the dysenteric symptoms are severe, but for some time uncomplicated; afterward, however, the stools become putrid, "status nervosus, collapsus," and paralytic symptoms set in, accompanied by albumen and casts in the urine; these cases terminate either fatally or in recovery: in the latter event the urine regains its normal characters before convalescence occurs. In the third group of cases the dysenteric symptoms are still more violent at the beginning, and the putrid stools, collapse and paralytic symptoms, accompanied by albumen and casts in the urine, set in very early; these cases speedily terminate in death, and on the autopsy the kidneys are found in the first stage of Bright's disease. In the last group of cases, which may be designated "paralytic" dysentery, putrid stools, collapse and paralytic symptoms are present from the very first; the urine from the very beginning contains albumen and casts; in some cases there is complete suppression of urine, and cramps in the calves occur as in Asiatic cholera; these cases generally terminate fatally, and the kidneys are found exceedingly hyperæmic with the urinary tubules filled with casts, ("die Nierenkanälchen angefüllt mit Exudat, Zellen und Detritus.") But even these cases sometimes terminate favorably; before the violent symptoms have lasted very long, they begin to moderate, the urine gradually becomes normal, and convalescence follows. Each of these grades of kidney complication is illustrated by a selected case reported in detail.

however, admits that in certain cases of dysentery albumen and casts are present in the urine, and the kidneys are found after death to present the initial lesions of Bright's disease. This complication is, however, more common in chronic dysentery, as we shall have occasion to see hereafter.

NAUSEA AND VOMITING.—These symptoms are of frequent occurrence, although some cases run their course without the first and very many without the second. The opinion that bilious vomiting at the commencement of dysentery is a symptom of evil omen antedates the Hippocratic era,* and was probably founded upon the observation of a class of severe cases which commence with bilious vomiting and purging, and are still common enough, especially in malarial regions. These cases are most apt to occur in the summer, during extremely hot weather, and resemble at their commencement the so-called cholera morbus which is so frequent at the same season; subsequently, however, the discharges assume the dysenteric characters, and if the vomiting persists the patient speedily perishes. Such cases were common enough during the civil war. In another group of cases, commencing also with vomiting and purging, the matters vomited contain no bile, are watery, almost colorless, and of a feebly mawkish odor like the discharges of Asiatic cholera; watery purging at the beginning is speedily replaced by discharges of a bloody sanies, and the patient early falls into a condition of extreme dysenteric collapse. Cases of this kind were observed by Finger in the Prague hospital;† they occurred but rarely during the civil war. Both these groups of cases appear to result from the development, simultaneously with the dysenteric attack, of a more or less intense catarrh of the mucous membrane of the stomach.

But vomiting is by no means always of such serious import; very frequently it is merely the expression of a higher degree of that gastric irritability indicated by the nausea which so commonly accompanies the early stages of dysentery. Sometimes it occurs only after the ingestion of food or drink, and can be prevented by the judicious regulation of the diet; at other times no such care exercises any controlling influence. Vomiting frequently sets in also, at some later period of the disease, in patients who were free from it at the beginning. In this case, too, it may be a mere functional disturbance; or it may result from the gradual progress upwards into the stomach of the catarrhal inflammation of the small intestine, which so commonly accompanies the dysenteric process in the colon; or it may be a symptom accompanying the development of intercurrent peritonitis, or the occurrence of extensive sloughing in diphtheritic cases. The judicious practitioner can generally distinguish the nature of the more serious cases, but it is by no means easy or always possible to discriminate between those in which the gastric irritability is a mere functional disturbance and those in which a moderate degree of gastric catarrh actually exists. That the latter is of very frequent occurrence is indicated by the appearances found on dissection.

INDIGESTION.—It seems hardly necessary to mention that dysentery is always accompanied by a diminution of the digestive powers, proportioned to the activity of the disease; but it is sometimes forgotten by the practitioner that, in extreme cases, the scanty digestive fluids may entirely lose their capability of transforming the food, and that nourishment

* *Prenotions of Cos*, § 454, [Ed. Littré, V, p. 687.]

† FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift, 1849, Bd. IV, S. 139. In four of these cases death occurred on or before the fifth day. On dissection the stomach was found injected, coated with tough mucus, here and there eroded, or beset with aphthous ulcers, or even coated with pseudomembrane.

well adapted to the less severe forms of the disease may become a positive source of injury. Uffelmann* has pointed out that in intense dysenteric cases, especially those accompanied by persistent fever, with dry mouth and tongue, the scanty saliva is acid in its reaction, and its normal capability of transforming starch into grape sugar is entirely lost. That a similar loss of power is experienced by the pancreatic and intestinal juices, is indicated by the frequent presence of undigested starchy matters in the stools; and an examination of the stools and vomited matters further indicates great diminution or complete annihilation of the power of digesting albuminous bodies and fats in these severe cases. Under such circumstances the most various fermentative and putrefactive changes attack the undigested food in the alimentary canal, and the products of these changes no doubt often act as local irritants and aggravate the disease. Even in less severe cases of dysentery there is still always more or less diminution in the activity of the digestive fluids, in consequence of which, in spite of the most careful alimentation, it is impossible to replace the daily waste of tissue. Hence results the usually rapid emaciation which is so characteristic of the disease.

Nervous disturbances.—The most various nervous disturbances accompany the progress of dysentery. Of these, *insomnia* is one of the first to make its appearance. It results from the frequency of the stools by which the patient is continually disturbed at night; from the pain which prevents sleep even during the intervals of the stools; and from the general restlessness and nervous disorder, which, in the severer cases, ensue from the severity of the local disturbance. Considerable loss of sleep from these causes is undoubtedly an important factor in the production of exhaustion and dysenteric collapse. Restlessness and irritability, depression of spirits, and other manifestations of nervous disorder are common enough in the severer cases. Graver nervous phenomena are not common except in the later periods of fatal cases; subsultus tendinum is then not infrequent, and delirium, convulsions or paralysis, especially of one or both lower extremities, occasionally occur. Of these graver nervous symptoms delirium is perhaps the least common in uncomplicated dysentery, though not unusual when the disease is complicated with typhoid, typho-malarial or remittent fevers; in uncomplicated cases the intellect generally remains clear almost to the very last. *Hiccough* is another nervous phenomenon which occurs chiefly in the graver cases, and very often presages a fatal issue.

Complications.—Some of the more important complications of acute dysentery are next to be considered, viz: peritonitis, whether the result of intestinal perforation or otherwise produced; intussusception of some portion of the intestine, with or without sloughing of the invaginated part; hepatic complications; malarial fevers; typhoid and typho-malarial fevers; scurvy or the scorbutic taint; inflammations of the respiratory organs; rheumatism; tubercular diarrhœa; erysipelas; paralysis, etc.

*Peritonitis and Perforation of the Intestine.*—More or less hyperæmia of the peritoneal coat of the colon, corresponding to the parts at which the diphtheritic process is most intense or at which ulceration has penetrated most deeply, is of common occurrence in dysentery, as is shown by the record of autopsies. Not infrequently this hyperæmia is aggravated into genuine peritonitis, accompanied by plastic effusions which tend to produce adhesions between the affected portion of the colon and the abdominal walls or the adjacent viscera. This process is especially prone to occur in the cæcum, but it may happen in any portion

* Julius Uffelmann—*Die Störung des Verdauungsprocesses in der Ruhr*, Deutsches Archiv für Klinische Med., Bd. XIV, 1874, S. 228.

of the colon. It is indicated during life by excessive tenderness at one or more points along the course of the colon, and by a steady pain in the same region, which continues to be felt during the intervals between the paroxysms of tormina.

Local peritonitis once established may spread and involve the general surface of the peritonæum with fatal result. This happens especially in severe cases of diphtheritic dysentery in which those constitutional conditions, which favor the accumulation of a feebly coagulating granular fibrine rich in pus corpuscles (migrated white blood-corpuscles) on any surface that may be inflamed, are often established. In such cases exquisite tenderness of the whole abdominal surface and intense abdominal pain of a continuous character become prominent symptoms. The abdomen, previously sunken, becomes tympanitic or filled with fluid; the patient assumes the dorsal decubitus with the knees drawn up; his countenance becomes anxious, his pulse small and frequent, (120–140 or more,) and all the usual symptoms of general peritonitis make their appearance.

But the most frequent cause of general peritonitis as a complication of dysentery is a perforation of the large intestine, resulting from the extension of a dysenteric ulcer by erosion or sloughing. This leads to an extravasation of the intestinal contents which lights up a general peritonitis that is usually fatal.* The perforation most frequently occurs in the cæcum, but it may happen in any portion of the colon. When it occurs in the cæcum it may be preceded or accompanied by the formation of an abscess in the right iliac fossa, (*perityphlitis,*) which may discharge into the intestine or even, in rare cases, through the abdominal parietes.† Peritonitis resulting from perforation cannot be distinguished during life from general peritonitis unaccompanied by this accident. Whether general or local, it may give rise to considerable effusion of serum into the abdominal cavity, which sometimes remains in the form of well marked ascites after convalescence has set in. Such dropsical effusions are, however, much more frequent in the chronic cases.

*Intussusception of some portion of the intestine.*—It will be stated in connection with the morbid anatomy of dysentery that intussusceptions of the small intestine are frequently observed after death. These, in most cases, are unaccompanied by evidences of inflammation, and are probably phenomena of the death agony; but occasionally intussusception takes place in dysenteric cases during life and gives rise to all the usual phenomena of ileus, which appears then as a complication of the dysenteric process. When we consider the violent character of the peristaltic contractions, indicated by the tormina of dysentery, it seems wonderful that this complication does not occur more frequently. In point of fact, however, it must be very rare, for no cases of the kind were reported during the late war.

The occurrence of ileus during a dysenteric attack might be expected to prove promptly fatal, and from the character of the symptoms might readily be confounded with peritonitis,

* An interesting discussion of the various results of intestinal perforation will be found in the *Canon* of AVICENNA—Lib. III, Fen. 16, Tract. 1, Cap. 2, pp. 810 and 811, Ed. apud Juntas, Venice, 1595. Perforation is said to prove, as a rule, immediately fatal; sometimes, however, fæcal extravasation leads to a condition resembling dropsy, which proves fatal after more protracted suffering, and occasionally the abdominal walls are also perforated, fæcal matter is discharged through the fistula and the patient survives. This last result is to be regarded as a remote possibility which only very rarely happens. Some have asserted that if such a fistula communicates with the jejunum the patient dies of starvation. MATTHEW DE GRADIBUS—*Practica nouiter correcta*, Pars II, Cap. 12, Venice, 1502, fol. 285—in treating of dysentery, cites these observations of AVICENNA, and adds: "Ego tamen vidi in Papia unum doctum medicum magistrum Santinum de Filbertis qui hac passione premebatur cum emissione fæcum per uleus: tamen vixit viginti annis post."

† An admirable description of perityphlitis accompanying dysentery is given by BAMBERGER—S. 406, *op. cit.*, p. 266, *supra*: "In many cases in which the cæcum is the seat of deep ulcers, an inflammation with suppuration occurs in the cellular tissue found in the iliac fossa behind it, (*perityphlitis.*) If the inflammation does not extend to the peritonæum, or if putrid decomposition and pyæmic fever do not set in, a cure often follows through the gradual resorption of the exudation or its evacuation externally. The latter occurs most frequently through the perforated intestine." But it may take place also, though in rare instances, through the abdominal walls. An analogous condition may also occur, but still more rarely, in the left iliac fossa from perforation of the sigmoid flexure, as in a case (No. 173) related by HABERSHON—*Dis. of the Abdomen*, 2d Ed., London, 1862, p. 412—in which the cicatrices of dysenteric ulcers produced a stricture of the sigmoid flexure, above which fæcal accumulation gave rise to perforating ulcers and the formation of an abscess, which opened externally by several fistulæ in the left iliac region.

or even overlooked altogether. These symptoms are obstinate constipation, vomiting, abdominal pain and tenderness; the pain occurring both in colic-like cramps and as a steady pain in the intervals. But since in dysentery the fæcal discharges are usually suppressed, and the occurrence of an intussusception would not interfere with the discharge of mucus, pus, blood and bloody serum from the parts of the intestine below the intussusceptions, the symptom of constipation necessarily loses its diagnostic value; and vomiting so often happens in dysentery that it could hardly even suggest the possibility of ileus. Moreover, the vomiting would rarely acquire the fæcal character, which is so significant when it occurs, because in dysentery the contents of the alimentary canal do not usually possess this fæcal character. As for the colic-like pains of ileus, they differ in nothing from those of dysentery, nor the pain or tenderness from that of local or general peritonitis.

For these reasons should ileus supervene during dysentery it would be very apt to be overlooked, and to be discovered only on the autopsy in fatal cases, except when the intussuscepted portion of the bowel separates by sloughing and comes away by stool during the life of the patient. This occasionally happens in ordinary cases of ileus, and under favorable circumstances such patients may even recover, as is shown by the examples which have been collected by Morgagni, Cayol, Meckel, Autenrieth, Gaultier de Claubry, Thomson, Duchaussoy and Peacock.* There seems, therefore, to be no good reason for doubting the possibility of the occurrence of the same rare accident during the progress of dysentery, as in the instances reported by Sebire and Gautier de St. James, Baillie, Twining and Paterson;† or indeed during the course of an attack of diarrhœa, as in the cases observed

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* MORGAGNI—*De Sed. et Causis*, Epist. XXXI, § 26. J. B. CAYOL—*Mémoire sur une terminaison particulière de la gangrène dans les hernies*—published by the author as an appendix to his translation of SCARPA on *Hernia*, Paris, 1812, p. 413 *et seq.* J. F. MECKEL—*Handbuch der path. Anat.*, Bd. II, Abth. 1, Leipsic, 1816, pp. 378 and 403. H. F. AUTENRIETH—Tübingen, 1831—Diss. cited on p. 365, *supra*. GAULTIER DE CLAUBRY—*Sur la terminaison de quelques cas de volvulus par l'étranglement et la séparation totale d'une portion souvent considérable du canal intestinal*, Jour. Univ. et Hebdom. de Méd. et de Chir. Pratiques, XII, 1833, p. 373. WM. THOMSON—*Abstract of cases in which a portion of the cylinder of the intestinal canal, comprising all its coats, has been discharged by stool, without the continuity of the canal being destroyed*, Edinburgh Med. and Surg. Jour., Vol. 44, 1835, p. 296, and *Appendix* to the same, *op. cit.*, Vol. 45, 1836, p. 374; see note to p. 365, *supra*; in these papers the author gives very full abstracts of 43 such cases, (including those collected by AUTENRIETH,) in 19 of which the patient either recovered or was still living when the report was made, while 24 proved fatal; and in 18 of these an account of the autopsy is given. Three of these cases were instances of strangulated hernia with the passage per anum of the mortified knuckle of intestine; the rest were cases of ileus, and of these several occurred in patients suffering from diarrhœa or dysentery; see next note. A. P. DUCHAUSSOY—*Anat. Path. des Étranglements Internes*, Mém. de l'Acad. Imp. de Méd., XXIV, 1860, p. 97. The second section of this elaborate paper, p. 148, deals with the subject under consideration. The author, who was not acquainted with the "*Appendix*" to THOMSON'S first paper, states that, besides the 35 cases mentioned in that first paper, he has been able to collect 32 others; but though he makes several interesting statements with regard to them, he does not give references to the individual cases, so that I am unable to decide how many of them are included in THOMSON'S second paper or in the paper of PEACOCK. PEACOCK—*Invagination of Intestine: passage of a large piece of bowel by the rectum; recovery.* Trans. of Path. Soc. of London, XV, 1864, p. 113. In this paper the author cites, besides his own, 19 additional cases not contained in either of THOMSON'S papers, besides one contained in THOMSON'S second paper, which, singularly enough, he appears not to have seen. PEACOCK'S own case recovered, and it is remarkable that of the cases he has collected but two proved immediately fatal.

† SEBIRE et GAUTIER DE ST. JAMES—*Obs. sur une portion des gros intestins, extraite par l'anus*, Jour. de Méd., LXIV, 1785, p. 619—report the case of a man suffering with what his attendants regarded as the bilious dysentery of ZIMMERMANN, who passed per anum several portions of intestine which proved on examination to represent 18 inches of the colon and to consist of all its coats, for it is stated that the attachments to the mesocolon could be distinctly seen. The patient nevertheless made a good recovery. After a perusal of the prolix narrative of this case, I see nothing in it to exclude the opinion that probably only a small part of the length reported consisted of all the coats, and that the rest was made up of sloughs of the mucosa and submucosa and of pseudomembranes. On this supposition the case would not appear more extraordinary than that described by M. BAILLIE—*An account of a singular disease in the great intestines*, Trans. of a society for the improvement of Med. and Chir. Knowledge, II, 1800, p. 149—of a dysenteric patient who is said to have passed a portion of colon about six inches long, in which BAILLIE recognized "the remains of the appendiculæ epiploicæ, and a part of one of the longitudinal bands," and also a considerable portion of mucous membrane coated "with a layer of coagulable lymph." If these specimens are, as THOMSON supposes, (see p. 375, *Appendix*, cited in last note,) the specimens preserved in the Hunterian Museum at Glasgow—*Catalogue of* 1840: Great Intestines, Nos. 43-5, 8.—the patient died two years afterward, and a stricture of the colon was found at the point from which the slough separated; but in that case either BAILLIE'S description is inaccurate or the piece he described was not sent to the Museum, for the catalogue describes the portions passed per anum as "portions of the internal coat ulcerated off." THOMSON himself [see paper cited in last note] mentions having seen in MECKEL'S *Museum*, during a visit to Halle in 1825, a specimen catalogued "*Intussuscepta tenuis et crassi pars, dysenteria excreta*," and expresses the opinion that two specimens in the Fort Pitt collection are of the same nature. By his reference I find these specimens in the *Catalogue of the Museum of the Army Med. Dept., Fort Pitt, Chatham*, 1833, described as follows: Digestion, Div. 3, No. 53. "Portion of small Intestine, about seven inches in length, voided per anum." "From John Seary, 13th Light Dragoons, who perfectly recovered, and passed through the Invalid Dépot, at Fort Pitt, some years afterwards;" and No. 99. "Portion of Intestine passed per anum." Both specimens are recorded as from Madras. In the Catalogue of 1845 they are numbered 1116 and 1117. The first is figured in the 2d *Fasciculus of Anat. Drawings in the Museum at Chatham*, London, 1821, Plate VII, Fig. 9. It is not stated in either of the catalogues that these were from dysenteric patients. If, however, THOMSON'S supposition is correct, they would be similar cases to that reported by WM. TWINING—*Diseases of Bengal*, 2d Ed., Calcutta, 1835, Vol. I, p. 151, Case 23—in which a dysenteric boy passed by stool a portion of small intestine five inches long, composed of all the coats together with some smaller fragments, and afterwards recovered. Abstracts of the foregoing cases will be found

by Lembke and Westphal and Valleix,* especially as the same accident has been known to occur in consequence of the exhibition of a drastic cathartic.†

The sudden supervention of pain, vomiting and the other symptoms accompanying the occurrence of an intussusception would be much more apt to arrest attention and lead to an autopsy for the purpose of ascertaining their cause, if they occurred during an ordinary attack of diarrhœa than during dysentery. Accordingly, while in dysentery such cases as that recorded by Lettsom‡ must often escape recognition, the occurrence of fatal ileus during the progress of diarrhœa has been more frequently observed. As examples I may cite the cases reported by Shaw, Harris, Holmes, Todd, Wachsmuth and Mann.§ The occurrence of fatal ileus during the diarrhœa of children has especially attracted attention. Several of the writers on infantile intussusception have adverted to its occurrence during diarrhœa,‖ and recorded individual examples, some of which are mentioned in a foot-note.¶

in THOMSON'S paper, which I have compared with the originals cited and found to be substantially correct. I may add the following cases: R. BROWN—*Case of Sloughing and Discharge of 25 inches of large Intestine in Dysentery*, Trans. of Med. and Phys. Soc. of Bombay, Vol. I, 1838, p. 336. The patient was a soldier of the 3d Troop Horse Artillery, admitted with dysentery, Nov. 30, 1831. Dec. 29, the piece described came away: "on dissection the three coats could readily be separated: the fatty appendices, and the three longitudinal fibrous bands, were distinctly visible." The patient died Jan. 27, 1835. "The large intestines were much shortened, and not a vestige of the sigmoid flexure existed. There were morbid adhesions at the posterior part of the bladder," &c. PATERSON—*Portion of Intestine discharged after Intussusception*, Edinburgh Monthly Jour. of Med. Sci., XVIII, 1854, p. 283. A girl aged nine years had an attack of dysentery; symptoms of ileus supervened, and a portion of intestine ten inches long was passed by stool. The child "made a perfect recovery."

* As examples of this occurrence in diarrhœa I note the following cases: LEMBKE and WESTPHAL—*Diss. qua pars intestini jejuni per guttus inferius excreta salva manente ægri vita describitur*, Gryphiswald, 1741, in HALLER'S *Disp. ad Morb., Hist. et Cur.*, T. III, 1757, p. 503—in which a man suffering from a putrid diarrhœa passed by stool a portion of small intestine, including all the coats, with a piece of mesentery adhering to its side. The patient recovered from all the violent symptoms, but his bowels remained loose; also a case cited by THOMSON, which I have not been able to see in the original—*Racconto di un fatto rarissimo, di considerevole porzione d'Intestino evacuato per secesso, anno* 1805, Alessandria—of a woman suffering from colic, with bilious vomiting and bloody diarrhœa, who passed a portion of the cæcum, with the vermiform appendix attached, by stool. The woman died some six weeks after, and an interesting account of the autopsy is given; and a case reported by VALLEIX—*Note sur un cas d'expulsion par l'anus d'une portion de l'intestin*, &c., L'Union Médicale, Feb., 1850, p. 57—An infant thirteen months old, who had previously suffered from constant diarrhœa, passed a portion of small intestine accompanied by two diverticula which were united to it. Symptoms of ileus, if recognized, are not mentioned, and the result of the case is not given.

† As an example of this accident, I may cite a case reported by GAY—*Intestinal obstruction followed by the separation of a portion of intestine*, Trans. of Path. Soc. of London, VI, 1854-5, p. 193—A child æt. 6 took a dose of salts and senna which acted violently; almost immediately after symptoms of ileus occurred, followed 15 days later by the passage of a portion of the small intestine (including all the coats) about three inches long. The child recovered.

‡ JOHN C. LETTSOM—*History and dissection of an extraordinary introsusception*, Philosoph. Trans., 1786, p. 305—A child 4 years old had cholera morbus followed by dysentery in October; after partial convalescence a relapse of the dysentery occurred in December, "accompanied with a troublesome tenesmus, and a considerable degree of fever." Toward the close of that month, "after repeated vomitings of a dark-coloured fluid, like coffeegrounds," the child died. On the autopsy the ileum, cæcum and vermiform appendix, ascending, transverse and a part of the descending colon, and of the omentum were intussusceipted into the sigmoid flexure and there strangulated. "The cavity of the abdomen also contained more than half an ounce of thin pus;" and the "inclosed intestine was very much diseased, the upper part next the band being highly inflamed, and as it approached the caput coli in the rectum gradually terminated in mortification, so that for three inches from its extremity it was perfectly black." This intussusception was not recognized during life.

§ In all these cases the fatal ileus supervened upon diarrhœa in adults, and on dissection the involuted parts were found inflamed or even gangrenous. WM. SHAW—*History of a case of introsusception*, Philadelphia Med. Museum, II, 1805-6, p. 286. ELISHA HARRIS—*Report of a case of Introsusceptio ilii*, The New York Journal of Med., Vol. V, 1850, p. 333. HOLMES—*Intussusception of the sigmoid flexure of the colon and of the upper part of the rectum*, Trans. of the Path. Soc. of London, VIII, 1856-7, p. 177. R. C. TODD—*Intussusception in a soldier thirty years of age, associated with a polypus of the intestine affected, and with the existence of numerous parasites (the trichocephalus dispar) in the caput cæcum*, Statistical, Sanitary, and Medical Reports, Vol. VI, for the year 1864, (London, 1866,) p. 528. To this case some interesting remarks by Prof. WM. AITKEN are appended, from which I cite the following: "In all the dissections of invagination whose history I have examined, they have either been associated with the diarrhœa of irritation (as from worms, undigested masses of food); or with cerebral lesions (as in the cases of children in whom invaginations are very common); or with ulcers of the intestines, or polypoid growths as in this case," p. 534. A. WACHSMUTH—*Ileus und Enterotomie*, Virchow's Archiv, XXIII, 1862, S. 118. In case 3 of this paper the invagination supervened upon a chronic looseness of the bowels, (2-3 stools daily.) The author also mentions (S. 133) the case of a man 45 years old in whom a sudden attack of diarrhœa (six stools rapidly following each other) was followed by death on the fifth day, with symptoms of ileus. The colicky pains which accompanied the first stools were so sharp that the patient threw himself down and pressed his belly against the ground; and the author suggests that this may have determined the invagination. W. S. MANN—*Case of Intussusception, with remarks*, The Birmingham Med. Review, Vol. I, 1872, p. 213. A widow aged 35 was attacked with vomiting and purging, followed by fatal ileus. The seat of the intussusception was the descending colon.

‖ For example: WM. BRINTON—*Intestinal Obstruction*, London, 1867—who analyzed "about 600 necropsies of such obstruction," (p. 38,) remarks: "In many of the infantile cases, the occurrence of the lesion immediately followed a casual or artificial diarrhœa—a coincidence which also obtained in some of the adults. A proneness to intestinal derangement, especially to constipation or diarrhœa, is also a frequent feature of the previous history," (p. 43.) See also an excellent paper by J. L. SMITH—*Statistical researches relative to the seat, symptoms, pathological anatomy, prognosis, treatment, &c., of Intussusception in children*, The American Jour. of the Med. Sciences, Philada., Jan., 1862, p. 17; and consult MEIGS and PEPPER—*Diseases of Children*, 4th Ed., Philadelphia, 1870, p. 423.

¶ In all these cases the fatal ileus supervened upon diarrhœa in young children, and on the autopsies intussusceptions were found with evidences of inflammation or gangrene of the involuted parts. E. Y. STEELE—*Cases of intussusception in infants*, The Lancet, Vol. I, 1840, p. 789—child aged 6 months, in whom the intussusception followed a "slight diarrhœa," and two other cases in which this antecedent had not occurred. C. CLARK—*On a case of intussusception of the intestines*, The Lancet, Vol. II, 1840, p. 293—child aged 6 months. EDWARDS—*Intussusception of the large intestine—the cæcum protruded through the anus, and the small intestine terminating by a valvular opening at the anus*, Medical Times and Gazette, London,

That a fatal ileus may be produced by the excessive action of a cathartic medicine would seem to be shown by the cases reported by Ballard and Gay.*

*Hepatic complications.*—More or less disturbance of the secretory function of the liver undoubtedly occurs in the great majority of cases of dysentery. It is usually manifested by a diminution in the quantity of bile which reaches the intestinal canal, as shown by its absence from the discharges from the bowels, which are often deficient in this respect for days or weeks. In other cases, however, the secretory function of the liver appears to be stimulated to excessive action and an unusual quantity of bile is poured into the alimentary canal, giving rise to copious vomiting and purging of bilious matter, especially at the commencement of the dysenteric attack. It appears probable, from a passage in the Prenotions of Cos,† that the term Bilious Dysentery was applied to this latter class of cases by the older Greek physicians even before the time of Hippocrates, and it is still conveniently used in the same sense at the present day.

But bilious dysentery, as thus understood, must be discriminated from Hepatic Dysentery or the Hepatic Flux, terms which the later Greek physicians and their followers, as late as the latter part of the last century, bestowed upon a form of flux characterized by watery discharges discolored with blood, and supposed to depend upon atony or imbecility of the liver. Archigenes‡ described such a flux as resulting from the ulceration following a hepatic abscess, and compared the putrid sanious stools to the fluid which drains from the bodies of the dead. Aretæus§ affirmed that abscesses of the liver sometimes discharge into the intestines, and stated that after this accident watery dejecta often follow, which after a time come to resemble the washings of flesh; but it was Galen‖ who first broadly taught that stools resembling the washings of flesh are due to atony of the liver, and Alexander of Tralles,¶ adopting the Galenical doctrine, bestowed upon this form of flux the name hepatic dysentery. Under this name it was also described by Paulus Ægineta,** and an article in the dictionary of Gorræus†† shows that this designation was still currently employed in the same sense among the physicians of the seventeenth century. Galen had

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Nov. 23, 1861, p. 531—child aged 3½ years. J. L. SMITH—*Intussusception of the small intestines in infancy*, The New York Med. Record, June 1, 1866, p. 177—child 4 months old, (case 2.) The paper contains two other cases which did not follow diarrhœa. SCHÜTZ—*Zur Lehre von der Impermeabilität des Darmes*, Prager Vierteljahrschrift für die Prakt. Heilkunde, 1868, Bd. II, S. 10—boy aged 7 years. J. O. AFFLECK—*Two cases of intussusception in children*, Edinburgh Med. Journal, XIX, 1873, Part I, p. 238—a child of 7 months: case 2, a child of 5 months, recovered. *Extraordinary case of double intussusception*, The Lancet, May 17, 1873, p. 709—child aged 6 months. H. M. MADGE—*A case of ileo-cæcal intussusception in an infant of eight months*, Trans. of the Obstet. Society of London, Vol. XVI, (for the year 1874,) p. 219, London, 1875. R. BELL—*Intussusception of the large intestine; abdominal section*, The Cincinnati Medical News, March, 1876, p. 223—child 16 months old.

* T. BALLARD—*Intussusception of the ileum at the ileo-cæcal valve*, Trans. of the Path. Soc. of London, XVIII, 1866–7, p. 92. In this case the patient, aged 37, had "his bowels habitually loose to the extent of two or three actions in the day." After a hearty dinner he had some abdominal pain, for which he took a dose of castor oil "which operated twenty times." Fatal ileus supervened. Compare note † on the last page.

† The *Prenotions of Cos* are undoubtedly older than HIPPOCRATES, [see Ed. Littré, I, p. 350.] In the passage referred to in the text—*Prenotions of Cos*, § 24, [Ed. Littré, V, p. 687,]—bilious dysentery (χολώδης) is contrasted with bloody dysentery, (αἱματώδης,) the distinction being therefore evidently based on the character of the stools. In the same passage it is asserted that bilious vomiting at the commencement of dysentery is an unfavorable symptom. Bilious stools in dysentery are spoken of in various places in the Hippocratic writings, *e. g.*, *Epidem.*, Lib. III, Sect. 3, [Ed. Littré, III, p. 87;] *Epidem.*, Lib. VII, § 3, [*op. cit.*, V, p. 369.] The celebrated aphorism—*Aph.*, Sect. 4, 24, [Ed. Littré, IV, p. 511,]—that "Dysentery arising from Black Bile is mortal," may be mentioned in this connection. ARCHIGENES (*loc. cit.*, in note ‡ to p. 335, *supra*) explained this aphorism by the statement that intestinal ulcers produced by black bile resemble cancerous ulcers, but ventured to assert that he did not despair of curing dysentery caused by black bile in those cases in which that humor occurs as a critical discharge in the course of fevers. In the Hippocratic treatise *Prorrhetics*, Lib. II, § 22, [Ed. Littré, IX, p. 51,] inflammation of the liver (φλεγμονὴ ἥπατος) is spoken of as a complication of dysentery which indicates the probability of an unfavorable termination.

‡ ARCHIGENES in ÆTIUS—Tetrab. III, Serm. 2, Cap. 5, [Lyons Ed., 1549, p. 627,] *Cura hepatis exulcerati*—after the description referred to in the text, the author remarks that "the inexperienced, deceived by such a flux, may suppose the affection to be dysentery." In the same treatise, Cap. 1, ÆTIUS describes a bloody flux resulting from atony of the liver, after GALEN.

§ ARETÆUS—*De Causis et Signis Morb. Diut.*, Lib. I, Cap. 13, [Boerhaave's Ed., p. 42.]

‖ GALEN: See passages cited in note ‡ to p. 336, *supra*.

¶ ALEXANDER OF TRALLES—Lib. VIII, Cap. 3 and 4, [Basel Ed., 1556, p. 400 *et seq.*] The phrase used is ἡπατικὴ δυσεντερία. I am astonished that the ingenious ACKERMANN—*De dys. nntiq.*, Leipsic, 1777, Lib. I, cap. 3, p. 25—should affirm the rheumatic dysentery of this writer to be a variety of hepatic dysentery; compare p. 340, *supra*.

** PAULUS ÆGINETA—Lib. III, Sect. 42, [Transl. of Syd. Soc., Vol. I, p. 525.] In the Greek text the words employed are ἡπατηρὰ δυσεντερία.

†† GORRÆUS—*Def. Med.*, Opera, Paris, 1622, p. 245, Arts. ἡπατηρὰ δυσεντερία and ἡπατικοί. The latter is the article referred to in the text.

distinguished this form of flux, as well as some other varieties of bloody discharges from the bowels, from true dysentery, and it was probably this circumstance which led to the substitution of the term Hepatic Flux, under which the condition in question was described by Gordonius, Plater, Sennertus, Ballonius, Riverius,* and many other physicians from the thirteenth century to the latter part of the eighteenth.

But meanwhile other forms of flux besides those in which the discharge consists of bloody serum were ascribed to various disorders of the hepatic functions, especially by the Arabian physicians† and their followers; and Gordonius in the Lilium Medicinæ‡ not merely adopted this extension in the signification of the term, but went so far as to affirm that the hepatic flux might proceed from the disease of other organs besides the liver. However contradictory this latter opinion may appear, it was adopted by many subsequent writers, and although resisted by the stricter followers of Galen,§ was accepted in certain quarters as late as the last century, when we meet it, for example, in the Nosology of Sauvages,‖ by whom the term hepatirrhœa was brought into use as an equivalent, and in the Epitome of John Peter Frank.¶

The Galenical conception of the hepatic flux seemed reasonable enough so long as the Galenical doctrine that the liver is the great blood-making organ** continued to secure general belief; but after the discovery of the lacteals and of the thoracic duct this doctrine was successfully assailed by Bartholinus and Glisson,†† and their opinion that the function of the liver was limited to the secretion of bile was almost universally accepted until the modern era of hepatic physiology was inaugurated by the investigations of Magendie, Tiedemann and Gmelin.‡‡ But pathological hypotheses often survive the physiological beliefs upon which they are based, and the doctrine of the hepatic flux continued for a time to find supporters, although Sylvius§§ protested that he had himself never seen a case and knew of no one who ever had, and Ettmüller|||| more cautiously insinuated doubts with regard to the ancient view, and pointed out its incompatibility with the modern conceptions of the functions of the liver.

It received its death blow in 1793, when A. G. Richter¶¶ revived the almost forgotten explanation which, with some cautious reservations, had been advanced by the ingenious

* GORDONIUS—*Lilium Med.*, Partie. V, Cap. 16, Venice, 1496, Fol. 165. GORDONIUS was professor at Montpellier from 1285 to 1305, or later. FELIX PLATER—*Praxeos*, Basel, 1602-8, T. III, Lib. 2, Cap. 11; I cite the Basel Ed. of 1736, p. 792. SENNERTUS—*Pract. Med.*, Lib. 3, Part. 2, Sect. 2, Cap. 8, Opera, Paris, 1641, T. III, p. 192. BALLONIUS—*Consil. Med.*, Lib. 1, Consil. 53, Opera, Geneva, 1762, T. II, pp. 225 and 233. RIVERIUS—*Praxeos Med.*, Lib. X, Cap. 8, Opera, Lyons, 1679, p. 307.

† See, for example, AVICENNA—Lib. III, Fen. 14, Tract. 4, Cap. 1 and 2, Venice Ed., 1595, p. 776.

‡ "Fluxus sang. epaticus est fluxus ventris sanguineus virulentus veniens aliquando ab epate: aliquando ab aliis membris." *op. cit.*, fol. 182. On fol. 163, besides the discharges resembling lotura carnis, he speaks of chymous and chylous, watery, bilious and black discharges, pure blood, &c., as occurring in hepatic flux, remarking: "Fluxus autem ventris propter epar est multiplex."

§ Compare the passages cited in note * from SENNERTUS, BALLONIUS and RIVERIUS, and the discussion of the subject by PETRUS FORESTUS in the scholia to Obs. 21-24 of his *Obs. et Cur. Med.*, Lib. XXII, Leyden, 1596, p. 287 *et seq.* FORESTUS mentions with condemnation the views referred to in the text as innovations of the moderns, [neoterici.] Here also I may mention the somewhat confused account of the hepatic flux given by J. B. BIANCHI—*Historia Hepatica*, Geneva, 1725, T. I, Pars 2, Cap. 9, § 5, p. 172, and Pars 3, p. 455, De Fluxu Hepatico—who endeavored to reconcile the Galenical doctrine with modern views by the suggestion that the hepatic flux is a catarrh of the liver—"Fluxus hepaticus est Catarrhus hepatis."

‖ SAUVAGES—*Nosolog. Method.*, Amsterdam, 1768, T. II, p. 321. See note § to p. 347, *supra*.

¶ J. P. FRANK—*De Curandis Hom. Morb. Epitome*, Lib. V, Ord. 4, Genus 4, § 683. I cite the Milan Ed., 1832, T. III, p. 420.

** GALEN—*De Usu Partium*, Lib. IV. Note especially Cap. 2 and 12, [Ed. Kühn, III, pp. 267 and 296.]

†† The lacteals were discovered by ASELLI in 1622 and the thoracic duct by PECQUET in 1647. The various essays of BARTHOLINUS were reunited by their author in a little volume—THOMAE BARTHOLINI, *Opuscula Nova Anatomica, de lacteis thoracicis et lymphaticis vasis, uno volumine comprehensa*, Copenhagen, 1670—The celebrated epitaph on the liver, in which the end of its dominion was announced, will be found in this volume on p. 111. F. GLISSON—*Anatomia Hepatis*, Amsterdam, 1659. [First published London, 1654.]

‡‡ MAGENDIE—*Précis élémentaire de physiol.*, Paris, 4me Édit., 1836, T. II, p. 257 *et seq.* TIEDEMANN und GMELIN—*Versuche über die Wege auf welchen Substanzen aus dem Magen und Darmcanal ins Blut gelangen*, Heidelberg, 1820, which I have not been able to consult.

§§ SYLVIUS—*Praxeos Med.*, Lib. I, Cap. 13, Opera, Amsterdam, 1679, p. 181: "Fluxum Hepaticum, si aliis unquam, mihi, quod sciam, nunquam visum."

|||| M. ETTMÜLLER—*Colleg. Pract. de Morbis Humani Corporis in Genere*, Pars 1, Cap. 9, Opera, Lyons, 1690, p. 131.

¶¶ A. G. RICHTER—*Med. und Chir. Bemerkungen*, Bd. I, S. 144, Göttingen, 1793. He held that vomitus cruentus, morbus niger and fluxus hepaticus were merely varieties of intestinal hæmorrhage, and not separate diseases.

Bartholdus,* who sought the origin of the blood, admixed in the discharges of the hepatic flux, in rupture of the intestinal vessels; and the publication of his views was followed by the appearance of a critical article in the Journal der Erfindungen, Theorien und Widersprüche in der Natur- und Arzneiwissenschaft,† which reviewed the literature of the subject and arrived at the conclusion that the hepatic flux ought no longer to be regarded as a separate species of disease. In vain did Portal‡ endeavor to support the use of the term by citing individual cases. The few he was able to collect were merely examples of hepatic abscess discharging into the intestinal canal; but cases of this accident, which had been known even to the Greek physicians,§ afforded no real support to the expiring doctrine, and it has disappeared from the medical literature of the present century except as a matter of history.‖

Meanwhile Degner,¶ in his account of the epidemic of dysentery at Nimeguen** in 1736, brought again into use the term bilious dysentery, [dysenteria bilioso-contagiosa,] which he appears to have employed partly on account of the frequency with which he observed bilious vomiting and purging, especially at the beginning of his cases, but chiefly on account of his belief that a vitiation of the bile was the actual cause of the disease,†† a belief which led him to include under the designation bilious dysentery those cases also in which bile was not mingled with the discharges. This opinion of Degner was after all but a development of the doctrine of Galen,‡‡ still generally accepted in his time, that an acrid bile capable of excoriating the intestinal mucous membrane is the starting point in

* G. T. BARTHOLDUS—*Opera Med. Tripartita*, Frankfort, 1717, Pars II, Sect. 2, Cap. 4, § 7, De Vomitu Sanguineo et Fluxu Hepatico. The paragraph cited is so noteworthy that I add a translation: "The hepatic flux was ascribed by the ancients to the liver, but erroneously, for this is repugnant to anatomical laws. It proceeds rather from the mesenteric veins, which, being congested with blood, at last rupture the intestinal coats, and that blackish, more or less serous fluid, is ejected sometimes in considerable quantity, two or three pounds, with prostration of strength and appetite. Yet it is not to be denied that induration of the liver may sometimes produce this flux," p. 91. A somewhat similar view of the probable source of the discharge in hepatic flux will be found in R. A. VOGEL—*Academicæ Prælectiones*, Gottingen, 1772, § 283—who, however, brings forward the case of discharges from abscess of the liver to show that the hepatic source of a flux of this kind should not be rejected in toto. In like manner C. G. SELLE—*Med. Clinica*, Vienna, 1797, S. 420—remarks: "The source of the fluid discharged is not always the liver, but also often, and for the most part, the mesenteric vessels."

† Bd. I, Gotha, 1792-3, St. 4, S. 58, *Ueber den Fluxus Hepaticus;* also conclusion in Bd. II, St. 5, S. 22. An admirable article, the author of which is not named.

‡ ANTOINE PORTAL—*Obs. sur la Nature et le Traitement des Maladies du Foie*, Paris, 1813, Partie 2, Art. 20, p. 579—De l'état du Foie dans ceux qui sont morts du flux hépatique ou de l'hépatirrhée. The cases which he cites are from BONTIUS and LIEUTAUD, viz: J. BONTIUS—*De Med. Indorum*, Leyden, 1642: I quote from the reprint bound up with the *Med. Ægyptiorum* of P. ALPINUS, Leyden, 1718-19, Lib. IV, Obs. 9, De Apostemate Hepatis. This case of extensive hepatic abscess has figured largely in the literature of the hepatic flux. It is also cited in the *Sepulchretum* of BONETUS, Lib. III, Sect. 11, Obs. 25, and in the work of SAUVAGES, [cited on p. 393,] who states that he himself observed a similar case in 1730. The cases from LIEUTAUD will be found in the *Hist. Anat. Med.*, Paris, 1767, T. I, Obs. 714 and 728; the first borrowed from SYLVATICUS, the second from PANAROLUS. Both are given by LIEUTAUD under the head "Purulentia et abscessus hepatis." In this connection I may mention that a case very similar to that of BONTIUS is related by THOMAS JORDAN—*Pestis Phænomena*, Tract. I, Cap. 19, Frankfort, 1576, p. 223. So also two cases are given by BONETUS in the *Sepulchretum*, Lib. III. In the first, Sect. 10, Obs. 6, the case was complicated with diarrhœa and lientery, and among other lesions found after death the intestinal mucous membrane was gangrenous and fetid. In the second, Sect. 12, Obs. 6, in which the patient is said to have had a hepatic flux for ten months, an abscess of the mesentery was found. The four cases of FORESTUS [see note § to p. 393, *supra*] do not throw much light on the subject, since, as usual with his cases they all terminated in a happy recovery.

§ This is probably indicated by a passage in the *Prenotions of Cos*, Sect. 2, Paragr. 22, § 439, [Ed. Littré, V, p. 683, or Ed. Kühn, I, p. 308;] but certainly the passages cited above, (p. 392,) from ARCHIGENES and ARETÆUS, leave no doubt as to the knowledge which the Greek physicians possessed of this accident.

‖ See the Article *Flux Hépatique* by RÉNAULDIN in the Dict. des Sci. Méd., T. XVI, Paris, 1816, p. 45, and the Article *Fluxus Hepaticus* by HUFELAND in the Encycl. Wörterbuch der med. Wiss., Bd. XII, Berlin, 1835, S. 344. M. E. A. NAUMANN—*Handbuch der med. Klinik*, Bd. V, Berlin, 1835, S. 35—describing the rupture of hepatic abscesses into the intestinal canal, says that often after the first discharges "a diarrhœa similar to flesh-water obstinately remains, (Fluxus Hepaticus, Hepatirrhœa;)" and he mentions a similar discharge as occasionally observed during the progress of chronic hepatitis, [S. 44.] H. BRESSLER—*Die Krankheiten des Magens und Darmkanals*, Berlin, 1841, Bd. I, S. 480: Fluxus Hepaticus, Leberfluss—is one of the latest writers who treats of it under a separate head. His account is compiled chiefly from FRANK, VOGEL and RICHTER, (cited above.) That various hepatic diseases, by mechanical obstruction of the portal circulation, may produce a degree of congestion of the intestinal mucous membrane favorable to the production of intestinal hæmorrhages is not to be denied. This may happen in acute and chronic atrophy of the liver, in cirrhosis, in the pigment-liver, in syphilitic disease of the liver, in cancer of the liver, &c. Compare F. T. FRERICHS—*Clinical Treatise on Diseases of the Liver*. Transl. of New Syd. Soc. of London, 1860-1, Vol. I, pp. 220, 268, 346; Vol. II, pp. 36, 45, 161, 306 and many other places. But these hæmorrhages are usually pure blood, or blood variously mixed with the intestinal contents, and not the peculiar discharge supposed to characterize the hepatic flux. Besides the works cited in previous notes, the reader may consult the following dissertations: J. L. LOSS—*Disp. de Dysenteria Hepatica*, Leyden, 1706; A. CHR. EÜLHARDT—*Diss. exhibens Fluxum Hepaticum vulgò Die Leber-Ruhr*, Erfurt, 1728; F. G. GEORG—*Diss. de Dysenteria Hepatica*, Halle, 1747; P. A. DUESTERBERG—*Diss. de Fluxu Hepatico*, Berlin, 1818.

¶ J. H. DEGNER—*Hist. Med. de Dysenteria Bilioso-contagiosa quæ* 1736 *Neomagi et in vicinis ei pagis epidemice grassata fuit*. Utrecht, 1738

** Also written Nymwegen, Nijmwegen and Nymegen, a town in the Netherlands on the left bank of the Waal, between nine and ten miles south of Arnheim.

†† *Op. cit.*, Cap. 2, § 61-65 ‡‡ See note ‡ to p. 336, *supra*.

dysentery; nevertheless his descriptions served to direct attention to the existence of a group of dysenteric cases characterized by the prominence of the so-called bilious symptoms. This group of cases figures also in the account given by Zimmermann* of the Swiss epidemic of 1765, as the most common form of the disease during that epidemic; but Zimmermann carefully discriminated between these cases, which he supposed to owe their characters to the coexistence of a bilious fever and the other varieties of dysentery, and severely censured Degner† for his lack of discrimination.

But it was Maximilian Stoll‡ who first gave to the conception of bilious dysentery the form which it still retains. Stoll had completely emancipated himself from the belief that the bile was the agent which caused the dysenteric flux.§ He saw in the excessive discharges of bile and other evidences of hepatic disturbance merely a complication of dysentery which the hepatic disorder aggravated, but could not produce.‖ It is in this sense that bilious dysentery has also been described by Fournier and Vaidy,¶ who used the term gastric dysentery as an equivalent on account of the irritable condition of the stomach in these cases. In the same sense it has been employed by many subsequent writers, as for example Vignes, Cornuel, Haspel, Copland, Trousseau and Savignac.** Others, emphasizing the gastric disorder, make the bilious form a sub-variety of gastric dysentery, as has been done, for example, by Naumann and Hauff.††

The descriptions of bilious dysentery which these writers have given agree in all the essential points. They speak of a bitter taste in the mouth accompanied by nausea, often by bilious vomiting and purging, as ushering in the dysenteric attack. Sometimes an icteroid hue of the countenance was observed, which might even be so marked as to amount to actual jaundice; sometimes the urine contained biliary coloring matter. Uneasy sensations and tenderness in the hepatic region were observed in some of the cases, in some frontal headache, and other evidences of nervous disturbance supposed to depend upon the absorption of biliary matters attracted attention. All or a part of these symptoms are no doubt frequently observed at the commencement of dysentery, but as they occur in connection with cases of simple catarrhal dysentery as well as of the diphtheritic form of the disease, and as the severity of the hepatic disorder stands in no constant relationship to the character or intensity of the dysenteric process, it would seem more convenient to regard hepatic disorder, when it coexists, as a mere complication, than to group the cases in which it occurs as a special variety of dysentery.

These hepatic complications are especially frequent in warm climates, where the disorder of the liver often amounts to actual inflammation, culminating in the development of abscess. Accordingly abscess of the liver figures conspicuously among the com-

* J. G. ZIMMERMANN—*Von der Ruhr unter dem Volke im Jahr* 1765, Zurich, 1767. He designates the bilious cases in question as "Die Gattung, die ein gallichtes oder fäulendes Fieber begleitet," S. 354.

† *Op. cit.*, S. 347: "I regard him as a very good observer, and really a respectable physician; but not as a physician of real genius," &c., &c.

‡ M. STOLL—*Rat. Medendi* Pars III, Sect. 4, Caps. 2 and 4, Vienna, 1780, pp. 257 and 285.

§ For STOLL'S classification of the different varieties of dysentery, see note † to p. 342, *supra*.

‖ "Ea materies" (*i. e.*, the bile in excess) "morbum facit biliosum, *e. g.*, febrim biliosam, choleram, &c., verumtamen nondum dysenteriam." According to STOLL, bilious dysentery was the prevalent form of the dysentery endemic in many parts of Hungary during 1773 and around Vienna during 1776, *op. cit.*, p. 285. Bilious dysentery was also the prevalent form in the epidemic at Tournay, according to TONNELIER—*Précis historique de l'épidémie dissentérique qui a régné dans l'Arrondissement de Tournay, &c., dans les années* 1810 *et* 1811, in Corvisart's Journ. de Méd., T. 28, p. 348.

¶ FOURNIER et VAIDY—Art. *Dysenterie*, in Dict. des Sci. Méd., T. X—call it "La dysenterie gastrique ou bilieuse."

** P. VIGNES—*Traité Complet de la Dysenterie et de la Diarrhée*, Paris, 1825, p. 222. CORNUEL—*Mémoire sur la dysenterie observée a la Basseterre*, (Guadeloupe.) Mémoires de l'Acad. Royale de Méd., T. 8, Paris, 1840, p. 118. AUG. HASPEL—*Maladies de l'Algérie*, Paris, 1850–52, T. II, p. 41. COPLAND—*Dict. of Pract. Med.*, Vol. I, London, 1858, p. 701. He makes it a form of ndynmmic dysentery. TROUSSEAU—*Clinique Méd. de l'Hôtel Dieu*, 2me Éd., T. III, Paris, 1865, p. 162. SAVIGNAC—*Traité de la Dysenterie*, Paris, 1863, p. 136.

†† M. E. A. NAUMANN—*Handbuch der med. Klinik*, Bd. IV, Abth. 2, Berlin, 1835, S. 13—subdivides Die gastrische Ruhr (Dys. gastrica) into: (a) Die gallige Ruhr (D. biliosa) and (b) Die schleimige Ruhr, (D. pituitosa.) The same is done by HAUFF—*Zur Lehre von der Ruhr*, Tübingen, 1836, S. 208.

plications of dysentery in the writings of English physicians in the East and West Indies, and of the French physicians in Algeria and other French colonies. Chisholm and Annesley* employed the old term hepatic dysentery to designate cases thus complicated, but the historical associations which cluster around that phrase would appear to constitute an insuperable objection to its use in this new sense, and it seems far more convenient to speak of hepatic abscess, when it occurs in connection with dysentery, simply as a complication.

Amidst the urgent symptoms of dysentery, the comparatively insidious development of hepatic abscess is so often overlooked, that its frequency or rarity in various regions and at different times has been established by dissection rather than by clinical observation. Hence it appears convenient to postpone any discussion of the evidence relating to this subject until the post mortem appearances are under consideration. Let it suffice here to state in a general way that during the civil war hepatic abscess was far less frequent as a complication of dysentery than it is in the dysentery of the English and French tropical colonies, but yet somewhat more frequent than in the dysentery of Europe.

The symptoms to which the greatest importance attaches in diagnosticating the development of this complication are pain in the hepatic region and the physical signs of enlargement of the liver. The constitutional symptoms which often indicate the formation of uncomplicated hepatic abscess are so masked by those belonging to dysentery as to have little diagnostic value. Fever of a remittent or hectic character, night sweats, the sudden occurrence of a chill, and gradually progressing emaciation and debility are too common in uncomplicated dysentery to suggest hepatic suppuration. Of course the development of jaundice would suggest the physical exploration of the liver; but jaundice may occur without hepatic abscess, and the latter very frequently runs its course without jaundice, so that this symptom has no particular diagnostic value in this connection except so far as it may serve to suggest the desirability of physical exploration.

Pain and tenderness in the region of the liver are symptoms of much greater significance, although they are by no means invariably present. Tenderness on firm pressure is more rarely absent than pain. The pain may be acute, or dull and heavy. According to Murchison,† the former usually characterizes small multiple abscesses, the latter large single ones; because when the abscesses are multiple, inflammatory action is apt to be propagated from some one or more of them to the peritonæum, whereas the single large abscess usually commences in the interior of the liver, and therefore does not produce acute pain unless the pus approaches the surface of the organ so that the peritonæum is at length involved. This speculation has, perhaps, some foundation; at all events acuteness in the character of the pain usually indicates the existence of local peritonitis. The pain may be seated in any part of the region occupied by the liver. In some cases it is referred to the spine, and the patient describes it as though it had its seat in the vertebral column. It is

* COLIN CHISHOLM—*A Manual of the Climate and Diseases of Tropical Countries*, London, 1822, p. 58. The author was for a time Inspector General of Ordnance Hospitals in the West Indies, and his book chiefly refers to these islands. He affirms that hepatic dysentery is especially frequent in marshy situations where remittent and intermittent fevers prevail, and remarks that on dissection "The liver of all the viscera is found the most diseased—inflamed, enlarged, partially suppurated, or in some portions sphacelated, or in consistence like rotten cork," &c., &c. JAMES ANNESLEY—*Diseases of India*, London, 1828, Vol. II, p. 197—"Of Hepatic Dysentery or Dysentery complicated with Disease of the Liver." "In hepatic dysentery, therefore, we may consider the relation of morbid action as being chiefly of two kinds: *first*, that in which the dysenteric symptoms are produced by functional or organic disease of the liver; and *secondly*, that in which the diseased actions of the liver are excited by the dysenteric disease," &c., p. 199. DAVID CRAIGIE—*Elements of the Practice of Physic*, Edinburgh, Vol. I, 1837, p. 912—has used the term Hepatic flux in the same sense, which is still more objectionable.

† CHARLES MURCHISON—*Clinical Lectures on Diseases of the Liver*, Am. Ed., New York, 1868, p. 147 *et seq.* He designates the small multiple abscesses as "pyæmic abscesses," the large single ones as "tropical abscesses;" but this is surely quite arbitrary. Small multiple abscesses also occur in tropical climates, and large single ones in the temperate zone; nor is it improbable that a single large abscess may result from a single embolus obstructing a large vessel, just as multiple abscesses result from the obstruction of many smaller vessels.

often increased by taking a deep inspiration, or by the movements of the chest in sneezing, laughing, coughing, or even in speaking loudly. In some cases the patient complains also of a dull pain in the shoulder, a symptom mentioned in the Hippocratic writings.* The right shoulder is most frequently affected; and it has been suggested that this occurs when the abscess is seated in the right lobe, while if it is in the left lobe the pain affects the left shoulder.† This symptom is, however, an inconstant one, being perhaps more frequently absent than present, and sometimes arising from other causes.

The occurrence of pain in the hepatic region should lead immediately to careful physical exploration. In most cases, if there is an abscess, the area of hepatic dulness will be found to exceed its normal limits. In extreme instances the dulness may extend upward as high as the fourth rib or even higher, and downward as far as the line of the umbilicus or even lower. When there are many small abscesses the area of dulness corresponds in form to the usual outline of the liver; but in single abscesses of considerable size‡ the normal outline of the liver is often variously altered in accordance with the seat of the abscess and its size. Sometimes, where the collection of pus is large, bulging of the intercostal spaces may be observed, or the ribs may be pushed upward and outward so that the enlargement of the liver can be recognized by mensuration; in such cases fluctuation can generally be distinctly felt on careful manipulation. In a large proportion of the cases properly conducted physical examination will lead to a correct diagnosis.

The gradual enlargement of the organ from day to day can often be made out, and the rapidity with which it takes place will distinguish it from the enlargement due to echinococcus cysts or to cancer; but small multiple abscesses often exist in livers which are but slightly enlarged, and the same is also true of single abscesses of moderate size, or of the early stages of large abscesses. According to Rouis§ recognizable enlargement existed in but seventy-three of one hundred and twenty-two cases, and Frerichs‖ states that cases have repeatedly come under his own notice, in which no alteration in the size and form of the organ could be recognized, there was no abnormal tenderness, and local examination furnished no data whatever for forming a diagnosis. It is not wonderful, therefore, that less skilful observers often fail to recognize hepatic abscesses during life, and first learn of their existence in the course of post mortem examination.

A short dry cough is another symptom frequently observed during the progress of hepatic abscess. It may be due merely to the mechanical interference with the respiratory functions resulting from the enlargement of the liver, or may be caused by the extension of irritation or actual inflammation to the diaphragm or pleura. For the same reasons the respiration is often hurried, and the patient sometimes complains of dyspnœa. Hæmorrhage from the bowels is another occasional symptom, and sometimes is the immediate cause of death. Finlayson¶ has recently discussed a case of hepatic abscess, uncomplicated by dysentery, in which this accident occurred. Case 92 in the last section is an example

* HIPPOCRATES—*On Internal Affections*, § 27. [Ed. Littré, VII, p. 237.] Compare also GALEN—*De Locis Affectis*, Lib. V, Cap. 7, [Ed. Kühn, VIII, p. 345 *et seq.*]

† G. B. WOOD—*Practice of Medicine*, 6th Ed., Philada., 1866, Vol. II, p. 533.

‡ See MURCHISON, *loc. cit.*

§ ROUIS—*Recherches sur les Suppurations Endémiques du Foie*, Paris, 1860, p. 115.

‖ F. T. FRERICHS—*Clinical Treatise on Diseases of the Liver*, Transl. of New Syd. Soc. of London, Vol. II, 1861, p. 124.

¶ JAMES FINLAYSON—*On the relationship of Abscess of the Liver to Gastro-intestinal Ulceration*, The Glasgow Medical Journal, Feb., 1873, p. 171. He shows that in this case the hæmorrhage took place into the colon. An old and apparently healing ulcer was found in the stomach, but the colon was not ulcerated. He argues that hepatic abscesses, by interfering mechanically with the portal circulation, produce congestion of the mucous membrane of the colon rather than of the small intestine, and that this favors the development either of hæmorrhage or of inflammation, and hence (inter alia) of dysentery. A similar series of results may ensue from the portal obstruction produced by cirrhosis of the liver.

of hepatic abscess complicating acute dysentery in which a profuse hæmorrhage from the bowels carried off the patient. In case 578, the patient "passed suddenly a pint or more of blood;" but in this instance the hæmorrhage did not prove immediately fatal. In both these cases the abscesses were large.

When hepatic abscess supervenes during the progress of dysentery it serves of course to aggravate the constitutional disturbance, and the patient not unfrequently perishes before the pus has had time to discharge. In other cases the patient survives long enough for the abscess to rupture, which it may do in any of the methods that occur in uncomplicated abscesses. Thus the pus may escape into the abdominal cavity, into the pleural sac, into the air passages, into the alimentary canal, or externally through the skin; or this event may be anticipated by puncture or the use of the aspirator. In any event, however, the prognosis is of course more grave than in uncomplicated abscess of the liver.

*Complication with malarial fevers.*—Dysentery frequently prevails simultaneously with malarial fevers, and under such circumstances the two diseases, variously combined, often coexist in the same individual. The flux may attack those whose health is more or less impaired by the influence of chronic malarial poisoning, as well as those who are suffering from intermittent and remittent fevers. Moreover, during the civil war dysentery appeared to prevail, especially in the more malarious districts. Like the malarial fevers, it was more frequent and more fatal in the Central than in the Atlantic region, and, in a general way, assumed a graver character in the Southern than in the Northern portions of each, so that the remarks, made in a previous portion of this section* on the relation between the malarial fevers and diarrhœa, are true of dysentery also. The consideration of these relations led me in former publications† to give a prominent place to malaria among the causes of dysentery; but I agree with Virchow‡ that it should be classed rather among the predisposing than the determining causes of that disease.

The malarial influence appears to favor the development of simple inflammatory or catarrhal affections of the intestinal mucous membrane. I do not think that Virchow exaggerates very much when he affirms§ that almost all the febrile conditions which occur in swampy regions during the warm months, or during the prevalence of intermittents, are accompanied by such intestinal disorders, and that these are only too readily aggravated into dysentery. But undoubtedly also intestinal catarrhs, which may or may not pass into dysentery, are very readily provoked under the same circumstances in individuals in whom no febrile condition has been developed prior to their occurrence. If periodic fevers should subsequently set in, the flux not unfrequently also manifests a periodic type; but even when uncomplicated by the fevers, the fluxes of malarial regions sometimes exhibit more or less distinct periodicity.

These circumstances did not escape the observation of the ancient physicians. In the account given by Hippocrates‖ of the diseases prevalent among those who dwell in marshy

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* *Vide* p. 287, *supra*. Compare also the general discussion of the statistics of diarrhœa and dysentery in Section I.

† See Circular No. 6, War Dept., S. G. O., Nov. 1, 1865, p. 121; also J. J. WOODWARD—*Outlines of the Chief Camp Diseases*, Philadelphia, 1863, p. 223: "Malarial influence is a potent predisposing cause."

‡ R. VIRCHOW—*Kriegstyphus und Ruhr*, Virchow's Archiv, Ed. LII, 1871, p. 30.

§ *Loc. cit.* Compare also his admirable article, *Historisches, Kritisches und Positives zur Lehre der Unterleibsaffektionen*, Virchow's Archiv, Bd. V, 1853, S. 354: "sicher ist es, dass fast alle fieberhaften Zustände, wenn sie in warmer oder wenigstens milder Jahreszeit in sumpfigen Gegenden oder unter der Herrschaft von Intermittenten auftreten, mit katarrhalischen Affektionen der Darmschleimhaut verbunden sind. Treffen diese einen mit Kothmassen viel beschwerten Darm, so sind wahrscheinlich oft die Bedingungen der Steigerung des bisher einfach katarrhalischen Processes zum dysenterischen gegeben."

‖ HIPPOCRATES—*Airs, Waters and Places*, § 7. [Ed. Littré, II, p. 29.] He attributed these diseases to drinking the water of the marshes or stagnant pools, and mentions enlarged spleens and dropsies, as well as fevers, as prevalent affections.

districts and in the vicinity of stagnant pools, he mentions that in summer they are frequently attacked with diarrhœas and dysenteries as well as by periodical fevers; and the assumption of an intermittent form by certain intestinal fluxes, as well as by other local disorders, is mentioned in the fragments which have been preserved of the writings of Archigenes.* Among the Arabian writers, periodical fluxes are spoken of by Haly-Abbas, Avicenna and Albucasis.† Mercatus (1586)‡ mentioned dysenteric stools among the dangerous symptoms which may occur in pernicious tertian fevers. I cannot, therefore, fully agree with Sprengel,§ according to whom Diomedes Cornarius (1599) was the first to describe the intermittent form of dysentery.

After the introduction of Peruvian bark into European medical practice, however, critical attention was directed afresh to the periodical fevers and their complications, among which diarrhœa and dysentery were found to occupy a conspicuous place. Thus, Richard Morton‖ observed quotidian and tertian forms of dysentery during the London epidemics of 1666 to 1672, and described intermittent fevers as sometimes simulating cholera morbus, dysentery and other intestinal disorders. Torti (1709)¶ described forms of pernicious periodical fevers which were accompanied, especially during the paroxysms, by symptoms of cholera morbus, dysentery or the so-called hepatic flux, and made of this group of cases two of the seven species into which he subdivided the fevers in question; his account of dysenteric and atrabiliary tertians was substantially adopted by Burserius** and Alibert.†† Lancisius (1717)‡‡ saw dysentery prevail as a concomitant or sequel of the pernicious fever which was epidemic at Rome during the summer and autumn of 1695, and believed that it was often due to a translation or metastasis of the morbid influence which produced the fever.

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* In the American edition of ZIEMSSEN'S *Cyclopædia* [Vol. II, p. 558] HERTZ is made to say, in his article on *Malarial Diseases*, that ARCHIGENES "makes mention of masked intermittents, especially when appearing in the form of dysentery or diabetes." I note that in the original [ZIEMSSEN'S *Handbuch der Spec. Path. u. Ther.*, Bd. II, Th. 2, Leipsic, 1874, S. 531] the passage reads: "er führt daneben auch verlarvte Wechselfieber (namentlich durch Magen- und Harnruhr) an." The statement and its phraseology appear to have been borrowed without acknowledgment from SPRENGEL—*Geschichte der Arzneykunde*, 3te Auflage, Bd. II, Halle, 1823, S. 107—whose language is: "Verlarvte Wechselfieber, besonders in Gestalt der Magenruhr, der Harnruhr, und der Katalepse, beobachtete er ebenfalls," and who verifies this statement by three references, viz: AETIUS, *Tetr.* 3, *Serm.* 1, *Cap.* 37; Ib., *Tetr.* 3, *Serm.* 3, *Cap.* 3; CAELIUS AURELIANUS, *Acut., Lib.* 2, *Cap.* 10. Looking up these references, I find that in the last the author speaks, on the authority of ARCHIGENES, of the occurrence of catalepsy with periodic type. The second reference is to the chapter in AETIUS headed, "*De his qui per circuitum quendam sanguinem mingunt: Archigenis*," which discusses not diabetes, but periodical hæmorrhage from the kidneys—"Quidam per circuitus quosdam sanguinem è renibus excernunt." The first reference is to the chapter in AETIUS headed, "*De cœliaca affectione, Archigenis*, in which the following passage occurs: "Nosse tamen oportet, quod aliquando quidem per circuitus malum hoc adfligit, temporibus quibusdam alvo restitante, quibusdam vero ordinate per certas horas fluente: aliquando vero ineessanter apparet." I am obliged, therefore, to think SPRENGEL used the word "Magenruhr" in the passage cited above carelessly, since it properly means lientery rather than the cœliac flux. See, for example, in proof, the *Med. chir. Encyklopädie* of PROSCH und PLOSS, Bd. II, Leipsic, 1855, S. 588, or VOGEL—*Handb. der pract. Arzneywis*, Bd. VI, Stendal, 1816, S. 75; RICHTER, *Die spec. Therapie*, Bd. IV, Berlin, 1822, S. 146, and many other authorities might be cited. I note further that the French translator of SPRENGEL [JOURDAN, Paris, 1815, T. II, p. 77] erroneously renders the term "Magenruhr" by the expression "dyssenterie gastrique," which is properly the equivalent of "dysenteria gastrica." [*Vide* note †† to p. 395, *supra*.]

† HALY-ABBAS—*Lib. Totius Medicinæ*, &c., Lyons Ed., 1523, Serm. I, Pars 1, Lib. IX, Cap. 26, fol. 115—after distinguishing between intestinal and hepatic dysentery, says of the latter "nonnunquam ejus emissio sit per circuitus." AVICENNA—*Canon Med.*, Venice Ed., 1595, Lib. III, Fen. 16, Tract. 1, Cap. 2, p. 812—in a more general way mentions "fluxus ventris factus cum periodis," and ALBUCASIS—*Liber Theoricæ necnon Practicæ*, Augsburg, 1519, Tract. XVII, Sect. 1, Cap. IX, fol. 78—speaks of "fluxus qui certis paroxismis insurgit."

‡ L. MERCATUS—*De Febrium Essentia, Differentia, Curatione, et de Febre Pestilentiali*, Valladolid, 1586, Lib. VI, Section on "Tertiana perniciosa;" I cite from Opera, Frankfort, T. II, 1619, p. 396—"Alvi fluxus dysentericus" is mentioned among the dangerous symptoms.

§ SPRENGEL—*Op. cit.*, Bd. III, S. 286. He cites DIOMEDES CORNARIUS—*Consil. Med.*, Leipsic, 1599, p. 28. I have not obtained access to this work. HERTZ, *loc. cit.*, borrowing this statement of SPRENGEL, makes a curious blunder in copying the citation, writing *Com. Lips.*, 1599, p. 28; but the first volume of the Leipsic Commentaries did not appear until 1752.

‖ R. MORTON—*Pyretologia*, London, 1692, Appendix, p. 424 *et seq.* In Exerc. I, Cap. 4, p. 83, he speaks of intermittent fever "putting on the type of cholera morbus, griping diarrhœa, dysentery or simple vomiting." He lauds the employment of bark in the treatment. His peculiar theory of the unity of febrile diseases, however, seems to have led him into exaggeration; for he speaks of intermittent fever as simulating scarlet fever, erysipelas, &c.

¶ FRANCISCO TORTI—*Therapeutice Specialis ad Febres Periodicas Perniciosas*, [Modena, 1709.] I cite the Venice Ed. of 1755. His species were: 1, Choleriea vel Dysenterica; 2, Subcruenta vel Atrabilaris; 3, Cardiaca; 4, Diaphoretica; 5, Syncopalis; 6, Algida; 7, Lethargica. See Lib. III, Cap. 1, and Lib. IV, Cap. 1, 2 and 3.

** BURSERIUS—*Instit. Med. Pract.*, [Milan, 1781–5.] Hecker's Ed., Leipsic, 1826, T. I, p. 196. His description of Tertiana Dysenterica and of Tertiana Subcruenta vel Atrabilaris is avowedly modeled after TORTI.

†† J. L. ALIBERT—*Traité des Fièvres Pernicieuses Intermittentes*, 5me Éd., Paris, 1820. This writer, among a great variety of species, describes Fièvre pernicieuse intermittente cholérique ou dysentérique, Ch. I, Art. 1, and Fièvre pernicieuse intermittente hépatique ou atrabilaire, Ch. I, Art. 2.

‡‡ J. M. LANCISIUS—*De Noxiis Paludum Effluviis*, [Rome, 1717.] Lib. II, Epidem. I, Cap. 5 and 12. I cite Opera, Venice, 1739, pp. 192 and 200.

The opinion that the poison, whatever it be, which causes the intermittent and remittent fevers is capable of acting upon the intestines under certain circumstances and of producing diarrhœa and dysentery, has been expressed by many subsequent writers upon malaria and the malarial fevers, as, for example, by Senac, Fournier and Bégin, Monfalcon, Macculloch, Mongellaz, Boudin and Barker.* Even those who, like Griesinger and Hertz,† have been unwilling to commit themselves to this theory of causation, testify to the frequency with which dysentery and other fluxes occur in malarial regions, especially during the prevalence of the periodic fevers.

It would be easy to multiply examples of the epidemic or endemic occurrence of dysentery in association with intermittent and remittent fevers in various parts of Europe. The observations of Pringle, Roederer and Wagler, Donald Monro, Harty, Cheyne, Biermann, Kicker, Boullet, Baly, Gestin, Champouillon and Chollet‡ may be cited in illustration, and several other instances are mentioned by Molo§ in his account of epidemics of intermittent fever. The testimony of these writers shows that the combinations of the malarial fevers with dysentery may occur even in the temperate zone, but it is especially among Europeans in tropical climates that they have attracted attention.

In tropical regions dysentery is not only more prevalent and more fatal than in temperate latitudes, but it is very much more frequently associated with the periodical fevers. It is, moreover, especially apt to prevail in those districts in which these fevers are endemic, and at the time of year when they are most frequent and fatal. These circumstances have not unnaturally led many of the physicians who have observed and described tropical diseases to embrace the opinion that the malaria which produces the fevers is also capable of giving rise to dysentery, and that a part at least of the tropical dysenteries are due to this cause. Without attempting to enumerate all the adherents of this doctrine, I may cite Chisholm‖

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* J. B. SENAC—*De Recondita Febrium Intermittentium, tum Remittentium, Natura et de earum Curatione*, Amsterdam, 1759, Lib. I, Cap. 14, p. 76. FOURNIER et BÉGIN—Art. *Marais*, Dict. des Sci. Méd., T. XXX, (Paris, 1818,) p. 539. J. B. MONFALCON—*Hist. Méd. des Marais*, 2me Éd., Paris, 1826, p. 496. JOHN MACCULLOCH—*Malaria*, Am. Edit., Philada., 1829, p. 201. P. J. MONGELLAZ—*Monographie des Irritations Intermittentes*, Brussels, 1839, T. I, Liv. II, Ch. 1, Sect. 3, p. 393 *et seq.*; also T. II, Liv. I, Ch. 2, Art. 1, p. 188. J. C. M. BOUDIN—*Traité des Fièvres Intermittentes, Remittentes et Continues, des Pays Chauds et des Contrées Marécageuses*, Paris, 1842, p. 154. T. H. BARKER—*Malaria and Miasmata*, London, 1863, p. 18.

† W. GRIESINGER—*Infections-Krankheiten*, in Virchow's Handb. der Spec. Path. u. Ther., Bd. II, Abth. 2, S. 12. HERTZ—*Malarial Diseases*, in Ziemssen's Cyclopædia, Am. Ed., Vol. II, p. 570.

‡ PRINGLE—*Obs. on the Diseases of the Army*, 7th Ed., London, 1774, Part III, Chap. 6, § 3, p. 253—although he believed dysentery to be due to a specific contagion, was struck with the fact that during the campaigns of the English army in Flanders (1742-8) dysentery often occurred under the same circumstances as intermittent and remittent fevers, and that these fevers "sometimes ended in a bloody-flux." ROEDERER et WAGLER—*De Morbo Mucoso*, Gottingen, 1762, Sect. 1, § 6, p. 21—found the two diseases so associated during the Gottingen epidemic of 1760 that they called dysentery the daughter of intermittent fever. DONALD MONRO—*Diseases in the British Military Hospitals in Germany*, 1761-3, London, 1764, p. 63—"Oftentimes the bilious and malignant fevers terminated in the dysentery; or were accompanied with it, when it might be looked upon as a symptom of these fevers." WM. HARTY—*Obs. on the simple Dysentery and its Combinations*, London, 1805. The combinations described are with intermittent and remittent fever (Ch. 2) and with typhus, (Ch. 3.) The latter he regards as the only contagious variety of dysentery, (Ch. 4.) J. CHEYNE—*Med. Report of the Whitworth Hospital*, Dublin Hospital Reports, Vol. III, 1832, p. 1—expresses substantially the same opinion in his account of the Dublin epidemic of 1818. BIERMANN [Land- und Stadtphysikus at Peine in Hanover]—*Bemerkungen über eine in dem Bezirke meines Physikats im August und September dieses Jahrs herrschende Ruhr-Epidemie, complicirt mit Wechselfieber*, Med. Conversationsblatt, [of Hohnbaum and Jaba,] March 24, 1832, p. 88. ANTON KICKER [Kreisphysiker at Grätz]—*Bericht über die in den Bezirken Gutenhaag und Negau des Marburger Kreises in Steiermark vom 6. Sept. bis inclusive 8. Nov. 1841 geherrschte Ruhrepidemie*, Med. Jahrbücher des k. k. österreich. Staates, N. F., Bd. 34, 1843, S. 129. MAX. BOULLET—*Sur les causes d'une épidémie de dysenterie qui a régné dans un village de la Sologne, pendant l'automne de* 1836, Ann. d'Hygiène, T. XIX, 1838, p. 205. Most of the cases of dysentery in this epidemic either occurred as a sequel to intermittent fever or were accompanied by it in the same individuals. Sulphate of quinia was found to be a valuable remedy. This paper and the next two are worthy of special attention. WM. BALY—*Gulstonian Lectures. Lecture* 3, London Med. Gazette, Vol. IV, 1847, p. 530—"the dysentery observed in the Penitentiary at Millbank is really produced by malaria." H. GESTIN—*Épidémie de dysenterie dans le Canton de Pont-Aven, (Finistère.)* Archiv. Gén. de Méd., July, 1858, p. 5. This canton of Brittany is annually subject to intermittent fevers. The epidemic described occurred in the autumn of 1856; a large proportion of the cases were accompanied by intermittent and remittent fevers. CHAMPOUILLON—*Armée d'Italie—Diarrhée, dysenterie, fièvre intermittente en* 1859, Gazette des Hôpitaux, Nov. 8, 1859, p. 517. In the first corps of the French army, towards the end of July and the beginning of August, "la fièvre intermittente vint compliquer la plupart des cas de dyssenterie aiguë ou chronique." He derived advantage from the use of quinia in these cases. F. M. CHOLLET—*Étude sur une épidémie de dysentérie*, Paris Thesis, No. 45, 1871—in describing a little epidemic which broke out in August, 1871, at Pléchâtel, some 20-25 kilometres from Rennes, says that intermittent fever was the most frequent of the complications observed.

§ PH. J. VON. MOLO—*Ueber Epidemien in Allgemeinen und Wechselfieberepidemien insbesondere*, Regensburg, 1841, Abschnitt III, p. 74 *et seq.* See also p. 138.

‖ COLIN CHISHOLM—*Climate and Diseases, of Tropical Countries*, London, 1822, Part II, Ch. 3, p. 53—"The second species and the most dangerous, is that produced during the rainy and hot season, by marsh miasmata."

as having maintained it for the dysentery of the West Indies; Annesley, Grant, Hare and Cameron * for that of the East Indies; Haspel† for the dysentery of Algeria; and Sigaud‡ for that of Brazil.

But this view appears after all to have been based upon an incomplete survey of the facts. While it is true that dysentery often prevails in malarial districts along with the malarial fevers, it is also true that it occurs where these fevers are almost or quite unknown, and that in some districts in which they are endemic, dysentery is rare. Dutroulau§ has adduced examples of both kinds in his treatise on the diseases of Europeans in warm countries, and Hirsch‖ has based upon these and similar cases which he has collected, a valid argument against the hypothesis that malaria stands in an immediate causal relation to dysentery. Even the English physicians in India, notably Morehead and Martin,¶ begin to abandon the opinion that malaria is an exciting, and speak of it only as a predisposing, cause.

Colin** has recently attempted to prove that it is the use for drinking purposes of the water, impregnated with decomposing organic matters, which is so often found in marshy regions, that causes the intestinal catarrhs and dysenteries which occur in these districts, while the malarial fevers are the result of ærial emanations. This suggestion, if true, would afford a solution of many facts, especially in military experience, which are now difficult of explanation; but I am not satisfied that the argument by which it is supported does more than give it a certain air of probability as an ingenious hypothesis; and this hypothesis, it must be admitted, is hardly consistent with the facts to be presently brought forward with regard to the distribution of dysentery in time of peace among the civil population of the United States.

Nevertheless, it cannot be doubted that when the causes of dysentery act either upon a civil population or an army, those individuals whose resisting powers are diminished by debilitating constitutional conditions of any kind are especially prone to become victims, and in these cases the ordinary symptoms of dysentery are often complicated by phenomena resulting from the other morbid influences, whatever they may be. When the debilitating influence is malaria, whether expressed merely by the constitutional cachexia which may be described as chronic malarial poisoning, or by the actual existence of intermittent or remittent fevers, the ordinary course of dysentery is complicated by phenomena belonging to the malarial disease. Such complicated cases have been described by many American

* JAMES ANNESLEY—*Diseases of India*, London, 1828, Vol. I, p. 85—"The next disorder in importance to fever proceeding from marsh effluvia, is dysentery." ALEX. GRANT—*Remarks on hill diarrhœa, and dysentery*, Indian Annals of Med. Sci., Vol. I, No. I, 1853, p. 311. E. HARE—*Tropical fever and dysentery*, Id., Vol. I, No. 2, 1854, p. 457. J. C. CAMERON—*On the employment of Quinine in fevers and other diseases*, The Lancet, Nov. 9, 1861, p. 456. This opinion was shared by the Royal Commission on the sanitary state of the army in India. See *Report of the Commissioners*, Vol. I. London, 1863, p. xiv: "Next to fevers in frequency, but more fatal, comes the dysentery of India. In its causes it is intimately associated with tropical fevers, remittent and intermittent; so much so that where fevers are present dysentery is never far off."

† AUG. HASPEL—*Maladies de l'Algérie*, Paris, 1850, T. I, p. 40—"Or, ce dégagement miasmatique que nous savons donner naissance aux fièvres paludéennes, a été aussi signalé comme une cause très active de la dyssenterie." See also H. LELOUIS—*Quelques considérations sur la colite chronique observée dans les hôpitaux d'Alger, à la suite de la fièvre intermittente de la Métidja*, Paris Thesis, No. 208, 1836.

‡ J. F. X. SIGAUD—*Du Climat et des Maladies du Brésil*, Paris, 1844, p. 337—"je considère que l'hépatite et la dysenterie sont deux dépendances de l'élément intermittent."

§ A. F. DUTROULAU—*Traité des Maladies des Européens dans les Pays Chauds*, (1861,) 2me Éd., Paris, 1868, p. 112—"Ses foyers de prédilection diffèrent partout de ceux de la fièvre." Among other examples, he cites Réunion, where marsh fevers do not occur while dysentery is common, and Mayotte, where the reverse occurs.

‖ A. HIRSCH—*Handbuch der historisch-geographischen Pathologie*, Bd. II, Erlangen, 1862–4, S. 238. This author formerly held the opposite view: See his elaborate paper, *Die Ruhr nach ihrem endemischen und epidemischen Vorkommen*, Prager Vierteljahrschr. für Prakt. Heilk., Bd. XLVI, 1855, S. 73; Bd. XLVII, 1855, S. 45; Bd. LI, 1856, S. 102.

¶ CHARLES MOREHEAD—*Clinical Researches on Disease in India*, 2d Ed., London, 1860, p. 273 *et seq.* Sir J. R. MARTIN—*Influence of Tropical Climates*, 2d Ed., London, 1861, p. 429.

** LÉON COLIN—*De l'ingestion des eaux marécageuses comme cause de la dysenterie et des fièvres intermittentes*, Ann. d'Hygiène, T. 38, 1872, p. 241. I may add that N. CHAPMAN—*Remarks on chronic fluxes of the bowels*, American Journal of the Med. Sci., Vol. XIX. 1836, p. 86—mentions as a popular notion the belief that drinking the waters of the Mississippi was the cause of the chronic fluxes then of frequent occurrence in New Orleans. The opinion that drinking the waters of malarial regions may cause fluxes dates back to HIPPOCRATES; see note to p. 398, *supra*.

writers on dysentery since Sayre* reported that he had observed febrile exacerbations of a tertian type in an epidemic of dysentery at Bordentown, New Jersey, in 1792, and Currie† affirmed in 1811, that "in the Southern States of this country nothing is more common than to meet with patients with symptoms characteristic of the existence of dysentery and bilious fever at the same time."

Without attempting to enumerate all the American physicians who have published such observations, I may cite as examples the papers of Bowling, Long, H. W. Davis, Campbell, Evans, Dowell, Bemiss, N. S. Davis and Jones,‡ a list which it would be easy to enlarge. Nor is it surprising that some of these writers should have fallen into the error of believing both the dysentery, and the periodic phenomena with which it was accompanied, to be due to malaria as their common cause. H. W. Davis, Dowell, Jones, and especially Campbell,§ may be cited as having taken this view. Campbell bases upon it his strenuous advocacy of the use of quinine in the treatment, which is adopted for the same reason by H. W. Davis and Dowell. Even those who do not accept the malarial theory of causation have recognized the value of quinine in those cases of dysentery which complicate malarial conditions or are complicated by them. Of the writers referred to above, I may mention Evans and Bemiss as having taken this view, which was endorsed by several of the speakers in a recent meeting of the Central Kentucky Medical Association.‖ In time of peace, then, as well as during the civil war, the complication of dysentery with malarial fevers has frequently been observed in America.

During the war this complication was even more frequently observed than previously, because the great armies, moved suddenly from the Northern States into the malarial regions of the South, were exposed simultaneously to malarial influences and to the causes of dysentery. In the resulting compound, or hybrid forms of disease, the symptoms resulting from each cause often appeared together in the same individual from the beginning of the case to its end. Sometimes, however, dysentery, either of itself or as a sequel to diarrhœa, appeared as the primary disorder, assuming subsequently a periodic form either as to the flux itself or as to the accompanying fever; or ague or remittent fever made its appearance during convalescence from dysentery, or after it had become chronic.¶ In other cases the periodic fevers were the primary morbid condition, and dysentery alone, or preceded by diarrhœa, set in only after the health had been broken down by long con-

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* F. B. SAYRE—*Obs. on dysentery*, Philadelphia Med. Museum, Vol. I, 1804-5, p. 391.

† WM. CURRIE—*View of the Diseases most prevalent in the United States of America*, Philadelphia, 1811, p. 212. This observer believed that such cases were due to the joint effects of marsh miasmata, which produced the bilious fever, and of sudden vicissitudes of temperature, which caused the dysentery.

‡ W. K. BOWLING—*An inquiry into dysenteric bilious fever*, Western Jour. of Med. and Surg., Vol. I, 1840, p. 166. J. J. LONG—*A case of periodic dysentery*, [of quartan type,] Nashville Jour. of Med. and Surg., Vol. X, 1856, p. 31. H. W. DAVIS—*Dysenteria intermittens*, North-Western Med. and Surg. Jour., Vol. XIII, 1856, p. 295. ROBT. CAMPBELL—*Dysentery, its nature and pathology*, Southern Med. and Surg. Jour., Vol. XIII, 1857, p. 707. *The treatment of dysentery*, same Jour., Vol. XIV, 1858, p. 75, and *The appropriate treatment of dysentery*, same Vol., p. 107. J. P. EVANS—*Epidemic dysentery*, Charleston Med. Jour. and Review, Vol. XIII, 1858, pp. 433, 577 and 721. He asserts that intermittent dysentery of quotidian, tertian and quartan type is of frequent occurrence in the Southwest, p. 595. See also, by the same author, *Obs. on the diarrhœa of the South*, same Jour., Vol. VI, 1851, p. 309. GREENSVILLE DOWELL—*Diarrhœa hæmorrhagica*, (bloody flux,) Galveston Med. Jour., Vol. I, 1866, p. 43. S. M. BEMISS—*Clinical Memoranda*, New Orleans Med. and Surg. Jour., Vol. XX, 1867, p. 42. N. S. DAVIS—*Cases of dysentery complicated with malarious fever*, Chicago Med. Examiner, Vol. XII, 1871, p. 461. W. A. JONES—*Endemic dysentery*, [Union County, Kentucky,] Western Retrospect, Vol. I, 1872, p. 125.

§ See last note. I may add to those named in the text E. READ—*Dysentery and its treatment*, The Indiana Med. Jour., Evansville, Vol. I, 1854, p. 29, and *Medical Miscellanies*, Nashville Jour. of Med. and Surg., Vol. XIII, 1857, p. 377—who holds the opinion that the malaria acts by causing portal congestion, and bases on this view his recommendation of sulphate of magnesia as the most important article in the treatment. H. W. DAVIS, cited in the last note, also takes the view that the malaria acts by primarily producing portal congestion.

‖ See Abstract of Proceedings, in the Richmond and Louisville Medical Journal, Vol. XVIII, 1874, p. 664.

¶ Compare the account of the combinations of intermittent fever with dysentery given by NAUMANN—*Handbuch der med. Klinik*, Bd. IV, Abth. 2, Berlin, 1835, S. 16; also the statement made by PARKES—*Dysentery and Hepatitis of India*, London, 1846, p. 126—of the modes in which he observed the malarial fevers complicate diarrhœa and dysentery in India. "The following are the chief varieties: 1. Regular ague with dysentery; the ague being generally of the quotidian or tertian type. 2. Irregular ague (that is, ague with short irregular intervals) with dysentery. 3. Either of these forms with asthenic diarrhœa. 4. Common bilious remittent fever with diarrhœa or dysentery. 5. Malignant remittent with diarrhœa or dysentery."

tinued ague, or after remittent fever had first been developed. Lastly, in yet other cases the malarial influence manifested itself by the production of chronic malarial poisoning; the resulting cachexia, whether existing by itself or associated with the mild scorbutic taint, which was so widely spread among our troops, especially after the first year of the war, undoubtedly appeared to favor the development of dysentery, as it did of diarrhœa. The subjects of this cachexia seemed less able to resist the causes of the disease than healthy men, and once developed in them, dysentery, even in its simple catarrhal forms, was more apt to become chronic and to prove fatal.

In a general way, then, the relations of the malarial diseases to dysentery were very similar to those which existed between these diseases and diarrhœa, on which comment has already been made. A striking description of one form of malarial complication will be found in Section II of this Chapter in the account given by Surgeon W. W. Brown, of the dysentery observed by him in the 7th New Hampshire regiment at St. Augustine, Florida.* A similar form was observed by Surgeon M. R. Gage† in the 25th Wisconsin regiment at Columbus, Kentucky. A milder variety was described, under the designation malarial dysenteric diarrhœa, by Surgeon J. L. Taylor,‡ as occurring in the 3d Missouri cavalry at Little Rock, Arkansas. Surgeon David Merritt§ saw in the 55th Pennsylvania, while stationed at Beaufort, South Carolina, numerous cases of intermittent fever complicated by periodical discharges from the bowels of a dysenteric character, which quinine alone was often sufficient to cut short. Most of the cases of dysentery observed by Surgeon H. P. Strong‖ in the 11th Wisconsin regiment, while encamped near Des Arc, Arkansas, were remittent in their character. Surgeon C. A. Hunt¶ saw numerous cases of malarial fevers complicated by dysentery in the 126th Illinois regiment at Jackson, Tennessee. These fragmentary reports, however, give no just idea of the extent to which the complications under consideration were observed, or of the number of those who, like several of the reporters in Section II,** were led to believe dysentery to be of malarial origin. A similar opinion was expressed by Assistant Surgeon Coues†† with regard to an epidemic at Columbia, South Carolina, in the fall of 1868, which may be taken as a type of many of the local outbreaks of dysentery that occurred in our camps and garrisons during the war.

*Complication with typhoid and typho-malarial fevers.*—During the civil war dysentery constantly appeared side by side with the continued fevers in the same command and at the same time; and as large numbers of men were simultaneously exposed to the causes of the malarial fevers, of typhoid fever and of dysentery, it is not surprising that two or more of these morbid conditions often coexisted also in the same individual. The complication occurred much in the same way as the complication with the malarial fevers; that is, the continued fever and dysentery ran their course simultaneously, or either appeared as the primary disorder to which the other was subsequently superadded. Not only has the occurrence of these several combinations of dysentery with the adynamic fevers long been recognized by medical writters, but a tendency has existed in certain quarters to over-estimate their frequency, by confounding the adynamic febrile symptoms which are not unfrequently developed in connection with certain forms of dysentery, especially the diphtheritic variety, with true typhoid or even typhus fever; an error which has undoubtedly been favored by the peculiar characters assumed by dysentery during certain epidemics.

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* Page 81, *supra*. † Page 93, *supra*. ‡ Page 86, *supra*. § Page 81, *supra*. ‖ Page 84, *supra*. ¶ Page 94, *supra*.
** See, for example, in Section II, besides the reports cited, those of VOLLUM, p. 76, GALL, p. 79, and BRETZ, p. 80. †† Page 62, *supra*.

This belief was the natural result of the teachings of Sydenham,* who had called attention to the close resemblance between the fever that accompanies dysentery, when it exists as an epidemic, and the other prevailing fevers of the same region and year. Zimmermann † enlarged upon this view, and divided acute dysentery into three genera: that which is accompanied by an inflammatory fever; that which is accompanied by a putrid or bilious fever, and that which is accompanied by a malignant fever. Harty and Cheyne ‡ especially emphasized the combinations of dysentery with typhus, which they regarded as the only contagious form of dysentery. Fournier and Vaidy § affirmed that dysentery complicated with typhus was the most common form of the dysentery of armies. They regarded it as eminently contagious, and suggested for it, though with great apparent hesitation, the designation typhous [typheuse] dysentery. Vignes ‖ closely followed their description of this form of dysentery, which he named the typhoid variety, and endeavored to distinguish it, as they had done, from the adynamic and ataxic forms.

Subsequently, while some writers, among whom I may mention Copland,¶ continued to employ the term typhoid dysentery to designate but one of several adynamic varieties of the disease, others, like Naumann,** embraced under the head of putrid or typhous dysentery all the various adynamic and malignant forms. So intimate did the relationship between dysentery and typhus appear, indeed, that Eisenmann†† went so far as to describe dysentery in general as a mere variety of typhus, Colotyphus or Ruhrtyphus, regarding it as simply a local expression of the action of the typhous miasma or contagion. But one of the consequences of the comparison of clinical observation with the results of pathologico-anatomical investigations, which has characterized the medical researches of the present century, has been to make it quite clear that the constitutional symptoms which accompany diphtheritic dysentery often closely resemble those which were formerly regarded as sufficient proof of the complication of the disease by typhus.‡‡

Moreover, the discovery of the peculiar lesion of Peyer's patches, which is the characteristic feature of typhoid fever, and enables it to be quite positively distinguished from spotted typhus on post mortem examination, has afforded an anatomical criterion for deciding the question of the complication of dysentery with typhoid fever—the form of typhus that most generally prevails in France and Germany as well as in the United States. The application of this anatomical criterion has so frequently shown the total

* SYDENHAM—[Transl. of Syd. Soc., London, 1848–50,] *Med. Obs. of Acute Diseases*, Vol. I, Sect. 1, Ch. 2, p. 38; Sect. IV, Ch. 3, p. 169, Ch. 4, p. 177; and other places.

† ZIMMERMANN—*Von der Ruhr unter dem Volke im Jahr* 1765, Zurich, 1767, Cap. X, S. 354.

‡ See note to p. 400, *supra*.

§ FOURNIER et VAIDY—Art. *Dysenterie*, Dict. des Sci. Méd., T. X, Paris, 1814, p. 355—"Cette espèce devrait être appelée dysenterie typheuse; mais nous n'avons point osé hasarder ce néologisme." These writers distinguish this form from those which they call adynamic and ataxic dysentery. Compare the following theses: F. LAMOUREUX—*De la dysenterie, considérée dans son état de simplicité et dans ses complications avec les fièvres inflammatoire, bilieuse et adynamique*, Paris Thesis, 1815, No. 38; C. J. DELASALLE—*Diss. sur la dysenterie, considérée dans son état de simplicité, dans ses complications avec les fièvres inflammatoire, muqueuse, bilieuse, adynamique, ataxique, et dans sa dégénération en chronique*, Paris Thesis, 1816. No. 165.

‖ P. VIGNES—*Traité complet de la Dysenterie et de la Diarrhée*, Paris, 1825, p. 242 *et seq.*—"Variété typhoïde."

¶ COPLAND—*Dict. of Pract. Med.*, Vol. I, London, 1858, p. 700. He distinguishes between "the nervo-adynamic, or typhoid" and "the malignant, or putrid" varieties.

** M. E. A. NAUMANN—*Handbuch der med. Klinik*, Bd. IV, Abth. 2, Berlin, 1835, S. 20—"Die faulige Ruhr (die brandige, die Lagerruhr; Dysenteria nervosa, asthenica, typhosa, septica, putrida, colliquativa, castrensis, pestilentialis, Fluxus virulentus.") The same view is adopted by G. C. F. HAUFF—*Zur Lehre von der Ruhr*, Tübingen, 1836, S. 276—who gives nearly the same synonyms, adopting himself the designation "die typhöse Ruhr," which is also employed in the same sense by H. BRESSLER—*Die Krankheiten des Magens und Darmkanals*, Berlin, 1841, Bd. I, S. 502.

†† EISENMANN—*Die Krankheits-Familie Typhus*, Erlangen, 1835, S. 362 *et seq.*

‡‡ Even in modern times, with all our improved methods of clinical observation, cases will occasionally occur like the one recorded by H. FREY—*Klinische Mittheilungen*, Zeitschrift für Rat. Med., Ed. V, Heidelberg, 1846, S. 187—in which the symptoms so closely resembled those of typhoid fever as to give rise to the belief that this was the disease, but in which, on the autopsy, the dysenteric process was found to be present in the colon to a marked degree, while the characteristic lesions of typhoid fever were entirely absent. Such errors of diagnosis will no doubt occur to the best observers, but I fear that a great many of the instances in which typhoid fever was entered on the hospital records during the late war, although the patient was in fact suffering from dysentery, as was subsequently shown by the autopsy, were not so excusable.

absence of the characteristic lesion of Peyer's patches in cases of so-called typhoid dysentery occurring under circumstances in which the non-existence of any cases of spotted typhus quite excluded the suspicion of complication with that disease, that Rokitansky * has even expressed the opinion that dysentery does not easily enter into combinations with the true typhous process—an opinion shared by Savignac,† who has expressed his belief that the complication of dysentery with typhoid fever is excessively rare.

That this complication may, however, actually exist, was, after the anatomical characteristics of typhoid fever had been established, first anatomically shown by Trousseau and Parmentier,‡ who, in 1826, observed the coexistence of the typhoid lesions with those of dysentery in two cases. Numerous observations of the same kind have since been made by Parkes,§ in India, by Baly‖ at the Millbank penitentiary, by Finger¶ during the epidemic of dysentery in the hospital at Prague, and by Lyons in the Crimea.** The latter, especially, has brought forward satisfactory evidence that in military experience, at least, the complication in question can hardly be considered a rare one. Colson†† has reported a number of similar cases observed in the French penal colony in Cayenne, and Herpain and Périer‡‡ have also each observed the coexistence of the characteristic lesions of typhoid fever and dysentery during the epidemic prevalence of the two diseases.

Accordingly, in most modern text-books§§ typhoid fever is now enumerated among the diseases which, by combining with dysentery, may modify its symptoms and progress; but it is probable enough that this complication is far less frequent in civil life than in armies, and that in armies it is especially to be looked for in time of war. Certainly our experience in this respect during the civil war corresponded with that of Lyons during the Crimean war, and the frequent coexistence of the two diseases in the same subject was not only made probable by clinical observation, but was established by numerous post mortem examinations, from a number of which specimens have been preserved in the Army Medical Museum.

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* C. ROKITANSKY—*Über Combination und wechselseitige Ausschliesung verschiedener Krankheitsprozesse, nach Beob. an der Leiche*, Österreich, med. Jahrb., Bd. 17, 1838, S. 220; also *Der dysenterische Prozess, etc.*, Id., Ed. 20, 1839, S. 94.

† J. D. DE SAVIGNAC—*Traité de la Dysenterie*, Paris, 1863, p. 104.

‡ A. TROUSSEAU et H. PARMENTIER—*Mém. sur une épidémie de dysenterie qui a régné dans le département d'Indre-et-Loire en* 1826, Archiv. Gén. de Méd., T. XIII, 1827, p. 377, and T. XIV, 1827, p. 33. The cases referred to will be found in the second paper, Obs. XIV and XV. The authors cite from MORGAGNI—*De Sedibus et Causis*, Epist. 31, § 2—a third case, in which the symptoms of typhoid fever came on some little time after the patient had suffered from those of dysentery, and in which on the autopsy ulceration and perforation of the ileum and ulceration of the colon were observed. In commenting on these cases the authors remark that the lesions of dysentery and those of the glands of Peyer are seldom found in the same subject.

§ E. A. PARKES—*Dysentery and Hepatitis of India*, London, 1846, p. 123. "In other cases there is enlargement and ulceration both of Peyer's and of the solitary glands, and general gastroenteritis." Singularly enough he only observed this complication in the scorbutic cases.

‖ BALY—*Gulstonian lectures on dysentery*, London Med. Gazette, Vol. IV, 1847, p. 470.

¶ FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift für die prakt. Heilk., Bd. 24, 1849, S. 135—asserts that during this epidemic both spotted and abdominal typhus complicated dysentery; sometimes the two diseases occurred together, sometimes dysentery attacked the convalescents from fever. In all, 231 post mortem examinations were made; in three cases typhoid infiltration and ulceration were observed in the ileum, while the characteristic dysenteric lesions existed in the colon. In eight other dysenteric cases the typhus or typhoid fever had run its course before death, and in the typhoid cases only cicatrices or pigment deposits remained; in the typhus cases no characteristic mark of its having existed was found.

** R. D. LYONS—*Report on the Pathology of the Diseases of the Army in the East*, London, 1856, p. 53—stated that he found in a number of instances on post mortem examination that extensive changes, attributable to typhoid fever, coexisted with the lesions of dysentery, and expresses the opinion that in the majority of instances dysentery was the primary disease, and typhoid fever was developed subsequently. See also the tabulated results of post mortem examinations in dysentery, p. 30 *et seq.*

†† COLSON—*De la dysenterie typhoïde*, Gaz. des Hôpitaux, Jan. 19, 1858, p. 26—records four cases observed in Cayenne; typhoid symptoms complicated the flux during life, and after death, besides the indications of the dysenteric process in the large intestine, thickening and inflammation of the patches of Peyer were observed in the ileum. In a former report quoted by SAVIGNAC, *loc. cit.*, which I have not seen—*Rapport médical sur les maladies qui ont régné sur l'établissement pénitentiaire de l'Ilet-la-Mère, du 20 août*, 1853, *au 6 août*, 1854, Montpellier, 1855—COLSON reports seven deaths occurring at the same place in which similar conditions were observed. In 1847, according to H. D. ERHEL—*Étude sur la dysenterie*, Paris Thesis, No. 254, 1851, p. 48—an epidemic of typhoid fever broke out at Taïti at a time when dysentery was also raging. The two diseases are said to have complicated each other in a small number of cases, but post mortem examinations do not appear to have been made.

‡‡ HERPAIN—*Hist. de la dys. épidémique qui a régné à Saint-Hubert en* 1863, Brussels, 1863. J. PÉRIER made his observations in the camp at Chalons in 1859. I have not found either paper, and quote from A. BARRALLIER—Art. *Dysenterie* in Nouveau Dict. de Méd. et de Chir. Prat., T. XI, Paris, 1869, p. 744—who, however, holds to the opinion of SAVIGNAC that the complication in question is very rare.

§§ See, for example, HEUBNER—*Dysentery*, in ZIEMSSEN'S Cyclopædia, Amer. Edit., Vol. I, New York, 1874, p. 555, or AITKEN—*Science and Practice of Med.*, 3d Amer. Edit., Vol. II, 1872, p. 651.

It will be most convenient to analyze the observations on this subject which were collected during our civil war in a subsequent chapter, after the characteristic lesions of fever have been fully discussed. Let it suffice to remark in this place that it was so common to find the characteristic lesions of typhoid fever in the ileum in cases in which the characteristic lesions of dysentery existed in the colon, that I have been led to the opinion that the combination of these diseases is exceedingly frequent in the camps of all armies in which typhoid fever is the prevailing variety of typhus; nor do I doubt that a similar combination with spotted typhus occurs in those countries in which this is the dominant form of typhus. Similar combinations with typho-malarial fever will be discussed in the chapter in which that form of fever is described.

*Complication with scurvy, or the scorbutic taint.*—The complication of dysentery with openly pronounced scurvy was not very frequently observed during the late civil war; but a widespread scorbutic taint existed among the troops, especially after the first year of the war, either by itself or variously combined with chronic malarial poisoning. Both catarrhal and diphtheritic dysentery were common enough among men suffering from either or both of these cachexias, and both were then especially apt to prove fatal or to degenerate into a chronic flux. The anatomical characters of such dysenteries offered, however, no essential differences from those occurring in subjects free from these taints. Perhaps serous effusions into the cavities of the abdomen and chest and adynamic inflammations, especially of the lungs and serous membranes, are more frequent when the scorbutic complication is well marked; but these complications offer no characteristic lesion, the presence of which in the corpse is a positive proof that the scorbutic lesion existed during life. The subject of the relation of scurvy and of the scorbutic taint is an important one, but it seems most convenient to postpone its consideration to the chapter on scurvy.

*Complication with inflammations of the respiratory organs.*—Bronchitis and pneumonia were common complications of acute dysentery during the war, particularly of the diphtheritic form. They occurred under the circumstances mentioned in connection with acute diarrhœa, but also as intercurrent complications of the advanced stages of the disease.* The latter was especially the case with pneumonia, which involved one or both lungs, and occurred with or without accompanying pleurisy. Pleurisy sometimes, but more rarely, made its appearance without pneumonia. These affections, when developed in the course of dysentery, exhibited no peculiarities which would make any special description necessary. The pneumonia usually exhibited itself in the lobar (croupous) form, and occurred most frequently in the colder seasons of the year. It will be shown hereafter that the lesions characteristic of this form of pneumonia were found after death in about one-fifth of all the autopsies of acute diphtheritic dysentery reported during the war.† Embolic pneumonia also sometimes occurred in the course of the diphtheritic cases, but was a comparatively infrequent complication.

*Complication with rheumatism.*—It was common enough during the civil war for patients afflicted with diarrhœa and dysentery, in their chronic forms especially, but also in acute cases, to complain of rheumatic pains in the back and limbs. I shall endeavor to

* These intercurrent complications occur quite independently of any such suppression of the dysenteric discharge, as was supposed in the Hippocratic era to precede their occurrence.—*Prenotions of Cos*, Sect. II, § 453, [Ed. Littré, V, p. 687:] "A dysentery checked in an untimely manner produces inflammation (ἀπόστασις) in the chest, (ἐν πλευροῖσιν,) the viscera, or the joints. Does bilious dysentery produce it in the joints, and bloody dysentery in the chest or viscera?"

† I shall show hereafter that this great frequency of intercurrent pneumonia is an unusual circumstance in dysentery, resulting probably from the excessive exposures of the civil war.

show in the chapter on scurvy that in great numbers of these cases the pains were not truly rheumatic, but were phenomena of the scorbutic taint, either existing alone or combined with chronic malarial poisoning. In my treatise on Camp Diseases* I proposed the term Pseudo-rheumatism as a convenient one to designate this group of cases. I am far, however, from doubting that the exposures of the war developed numerous cases of genuine rheumatism among those predisposed to that disease; and there is evidence enough that genuine rheumatism may complicate acute dysentery either during its progress or more especially during convalescence.

Sydenham observed, during the dysentery of 1672 in London, that in many cases the patients complained of pains in the muscular parts of the body, and especially in the joints, which he compared to the pains of rheumatism.† Similar observations were made by Akenside, Zimmermann and Lépecq de La Cloture,‡ but it was especially Maximilian Stoll § who directed attention to the complication of dysentery with rheumatism. His peculiar doctrine of the rheumatic nature of dysentery has already been referred to, and it was then mentioned that his descriptions appear to indicate that he had actually observed cases in which dysentery was variously combined with rheumatism as we now understand it. The influence of his authority undoubtedly induced many of his followers to interpret pains of any kind occurring during the progress of dysentery as rheumatic, and thus, for a time, exaggerated importance was attached to the supposed relationship between rheumatism and dysentery, while the subsequent reaction against this error has caused the occasional occurrence of rheumatic complications to be too generally overlooked. The actual existence of this complication is shown not merely by the occurrence of vague pains in various parts of the body, but by the development of well marked painful rheumatoid swellings of the larger joints.

Trousseau || in modern times has directed attention anew to this accident, and has expressed the belief that these swellings affect the knees more frequently than any other joints. According to him the swelling is occasionally accompanied by effusion into the joint, sometimes so considerable as to produce a rupture of the capsule; but he admits that most generally the rheumatic fluxion, whether in the joints or elsewhere, is quite transitory and erratic, flying from one part to another. He embraces these cases under the designation "forme rhumatismale," and Savignac ¶ has described them under that of "forme rhumatoïde."

In 1854 an epidemic of dysentery occurred in the Canton of Montargis in France, in which, according to Huette, complications of this kind were unusually frequent. Huette **

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* P. 318 of work, cited *supra* on p. 398.

† SYDENHAM—*Med. Obs.*, Sect. IV, Ch. 4, Transl. of Syd. Soc., Vol. I, London 1848, p. 179. NAUMANN—*Handb. der med. Klinik*, Bd. IV, Abth. 2, Berlin, 1835, S. 13—fell into the error of stating that this complication was observed by FORESTUS—*Obs. et Cur. Med.*, Lib. XXII, Obs. 19—but this observation, entitled "De fluxu ventris ex rheumatismo capitis vel catarrho orto," refers merely to a flux supposed to arise from the flowing down of a catarrh or rheum from the head, as explained *supra*, p. 340 *et seq.*, and not to what we now understand by rheumatism.

‡ AKENSIDE—See tract cited *supra*, on p. 342. ZIMMERMANN—*Von der Ruhr unter dem Volke im Jahr* 1765, Zurich, 1767, S. 17—compared the pains to those of a flying gout: "Andere befiel die laufende Gicht." L. LÉPECQ DE LA CLOTURE—*Coll. d'Obs. sur les Maladies et Constitutions Épidémiques*, Rouen, 1778, Part. II. p. 745—described an epidemic of dysentery at Caen and its vicinity, also in 1765, which he says often terminated in swellings of the joints similar to those of gout. Some of these suppurated, and such cases occasionally proved fatal, as he was informed by several of his fellow practitioners.

§ See p. 342 *supra* and notes.

|| A. TROUSSEAU—*Clinique Méd. de L'Hôtel-Dieu*, Paris, 1865, 2me Éd., T, III, p. 162.

¶ SAVIGNAC—*Traité de la Dysenterie*, Paris, 1863, p. 159.

** HUETTE—*De l'Arthrite dysenterique*, Archiv. Gén. de Méd., T. XIV, 1869, p. 129. He explains his use of the term arthrite by the remark "under the designation *arthrite dysenterique* we will describe the rheumatismal accidents which may manifest themselves in the joints during the course of epidemic dysentery or a little while after its cure." He states that he has looked for this complication in a number of epidemics since 1854, but never met it again. A very interesting abstract of this paper will be found in the Boston Med. and Surg. Jour., Jan. 13, 1870, p. 47, under the head of Dysenteric Arthritis.

relates the particulars of ten cases in which he observed well marked rheumatic swellings of the larger joints. In but two of these cases was there any previous history of rheumatism. The rheumatic symptoms appeared at any time after the second week of the dysentery, and usually affected several of the joints, especially the shoulder, knee or ankle, either simultaneously or successively. He regarded this form of rheumatism as similar in its symptoms and progress to gonorrhœal rheumatism, the chief difference being that the latter is usually limited to a single joint, or at most to two, while dysenteric rheumatism attacks several either simultaneously or in succession.

This comparison of course suggested to him the opinion that the intestinal affection was the cause of the rheumatic complication, but while he affirmed this to be the case, he frankly admitted that in certain epidemics only does it possess this power. As such epidemics he regarded that of 1765, described by Lépecq de La Cloture and Zimmermann; that of 1776–1777, described by Stoll; that of 1835, described by Thomas;* and that of 1854, which served as the basis of his own description.

Whether these are properly to be regarded as the principal epidemics of the kind or not, there appears to be no doubt of the fact that the rheumatic complication under consideration occurs with unusual frequency in certain epidemics. This appears to have been the case in the vicinity of Bloomfield, Ohio, during the epidemic year 1851. During that epidemic Mendenhall† observed many instances in which rheumatic inflammation of several of the larger joints occurred as a sequel to dysentery, and gives the particulars of two of them. I must confess that my own study of the literature of this subject inclines me to believe with Barrallier,‡ that the rheumatic symptoms occasionally observed in connection with dysentery are at best but an incidental complication, and that the two diseases when they exist together exercise little influence over each other's character or progress. Rheu-

* S. THOMAS [of Tours]—*Recherches sur la dysenterie*, Archiv. Gén. de Méd., T. VII, 1835, p. 455; T. VIII, 1835, p. 157; T. IX, 1835, p. 19. HUETTE cites from the second article a case—*Obs.* V—in which during the course of a fatal dysentery, in a man 21 years old, all the joints became successively painful and some of them the seat of purulent infiltration; the right knee and left wrist were laid open by a bistoury. To these particulars I may add, from the original paper, that the right thigh and left buttock were infiltrated with pus, and that a vast purulent collection formed over the sternum. On the autopsy extensive destruction of the mucous membrane of the cæcum and colon, which laid bare the muscular coat in many places, was observed. The left pleural sac contained a large quantity of serum and was lined by soft pseudomembrane. Accumulation of purulent fluid and erosion of the cartilages were observed in the sterno-clavicular articulations, the right shoulder joint, the left wrist and the right knee, and collections of pus over the sternum and in the buttock and thigh. Surely this was not a case of mere rheumatic complication, but rather an example of extensive metastatic suppurations BRAUN—*Beob. über Kniegelenkswassersucht*, Würtemb. med. Correspondenzblatt, Bd. VII, 1837, S. 52—reports that he observed at Stammheim, during the years 1833 and 1834, more than 40 cases of rheumatic pain and swelling of the knee, chiefly in males who were recovering from the then prevailing dysentery. He regards the joint trouble as a metastatic sequel (metastatisches Folgeübel) of the dysentery. The patients were, as a rule, poor people who had resumed work during convalescence, and the knee trouble set in after a few days' labor. WITOWSKY—*Schluss-Rapport über die Ruhr-Epidemie, welche in der 2ten Hälfte des Jahres 1846 im bunzlauer Kreise auf den Dominien: Nawarow, Semil, Jesseney, Morchenstern, Grossrohosetz und Grossskal geherrscht hat*, Prager Vierteljahrschrift, 1847, Bd. IV, S. 35—on the other hand reports (S. 44) that in the epidemic observed by him the rheumatic joint-complication frequently occurred at the beginning of the dysenteric attack, or at any time during its progress as well as during the convalescence.

† S. C. MENDENHALL—*Rheumatic inflammation as a sequel of dysentery*, Ohio Med. and Surg. Jour., Vol. IV, 1851-2, p. 376. After relating two cases somewhat briefly but clearly, he remarks: "Within the last ten months I have treated many such cases." He concludes: "Of two points I am confident—the disease is intimately connected with the antecedent intestinal disorder. It is radically different from the common forms of acute rheumatism."

‡ A. BARRALLIER—Art. *Dysenterie*, Nouv. Dict. de Méd. et Chir. Prat., T. XI, Paris, 1869, p. 749. In addition to the papers cited, I may add the contributions of RAPMUND—*Einige Fälle von Gelenkentzündung in Folge von Ruhr*, Deutsche Klinik, April, 1874, p. 132—and QUINQUAND—*Des manifestations rhumatoïdes de la dysentèrie*, Gaz. des Hôpitaux, 1874, pp. 419, 442, 650 and 658. RAPMUND, during an epidemic which prevailed in the fall of 1872 in the vicinity of Minden, attacking about 400 persons, saw six cases of the rheumatic complication occurring in convalescents from dysentery. The knee-joint was always first affected, afterwards in a few instances the ankle. One patient only (a woman who had previously suffered with polyarthritis) had also both wrists involved. All the patients had suffered from colds or exposures, which might be regarded as the causes. The author regards this complication as a subacute synovitis serosa, which he thinks is not true rheumatism, differing from it in the absence of the characteristic sweats, cardiac symptoms, &c. QUINQUAND makes four sporadic cases the occasion for an elaborate article, the historical portion of which betrays ignorance of ancient medicine. He appears to imagine the word rheumatism to have been used by the Greek physicians in its modern sense, and after citing the well known definition of CÆLIUS AURELIANUS asks: "C'et auteur avait-il déjà vu ces lésions des jointures? Nous l'ignorons." Like RAPMUND, he does not regard this affection as genuine rheumatism, but as a synovitis in some way dependent on the dysentery. A somewhat similar view has been advanced by R. VOLKMANN—*Die Krankheiten der Bewegungsorgane*, in Pitha u. Billroth's Handb. der Allg. u. Spec. Chirurgie, Bd. II, Abth. 2, Erlangen, 1872, S. 502—who groups the affection in question with the intercurrent synovial inflammations occasionally observed in measles, scarlet fever, small-pox, typhus, diphtheria, mumps and puerperal fever. J. KRÄUTER—*Ueber einige Nachkrankheiten der Ruhr*, Cassel, 1871—has suggested that the rheumatic joint-inflammations and conjunctivitis, which occurred as sequelæ in 8 out of 60 cases of dysentery observed by him in the villages of Furstenhagen, Arenborn and Oedelsheim during August, 1870, were due to the absorption of fæcal material from the intestines into the blood.

matism, like dysentery, has its seasons of epidemic prevalence in certain localities, and I presume that it is only when such epidemics coincide with epidemics of dysentery that the complication in question becomes at all frequent.

Undoubtedly, genuine rheumatism was a very common affection during the civil war, and it is probable enough that a portion at least of the cases in which it was supposed to complicate dysentery were correctly interpreted; but the reports are not sufficiently explicit to serve as the basis of an intelligent opinion as to the proportion of cases in which this actually happened as compared with the multitudes of those in which pseudo-rheumatic pains of the nature indicated above were mistaken for rheumatism.

*Complication with tubercular diarrhœa.*—As will be explained in a subsequent part of this chapter, I have been led to the conclusion that tubercular diarrhœa, or diarrhœa dependent upon intestinal catarrh consecutive to tubercular deposits in the intestinal walls, was more frequent during the civil war than has generally been supposed; and in this place I desire to call attention to the fact that dysentery may supervene upon such intestinal catarrhs quite as readily as upon those which arise from other causes. In post mortem examinations the coexistence of the tubercular and dysenteric processes is manifested for the most part by the presence of the characteristic tubercular ulcerations in the small intestine, and of the dysenteric lesions, whether catarrhal or diphtheritic, in the large. If tubercular ulcers had previously existed in the large intestine, they are most generally masked by the more turbulent and destructive dysenteric process. Finger* observed this coexistence of dysentery with tubercular ulceration in the Prague epidemic of 1846–48, and since that time its occurrence as a complication has been generally admitted by systematic writers. Specimens Nos. 244 to 261 inclusive, Medical Section, Army Medical Museum, afford a striking illustration of the lesions found in such cases. They are a series of pieces of the small intestine showing highly characteristic tubercular ulcers, and a portion of the colon of the same patient in which the lesions of diphtheritic dysentery are well marked. A more detailed account of this case, with plates representing one of the tubercular ulcers, will be given further on in connection with the subject of tubercular diarrhœa. I may add that both intestinal catarrh and diphtheritic dysentery were of frequent occurrence in patients laboring under tubercular disease of the lungs, in whom no tubercular deposit existed in the bowels.

*Complication with erysipelas.*—Both Finger and Griesinger† mention erysipelas among the complications of dysentery, an observation abundantly verified during the civil war. I am not, however, inclined to regard the two diseases as very closely dependent upon each other. Erysipelas is apt to occur epidemically wherever men are crowded together, and especially in prisons and hospitals. This was so often the case in our great general hospitals during the war, that it was frequently deemed desirable to establish "erysipelas wards" for the isolation and better treatment of those affected. Without entirely sparing the healthy, epidemic erysipelas was particularly apt to attack the wounded and those suffering with almost any form of disease. In the former case the erysipelatous inflammation most generally appeared first in the injured part, in the latter, some part of the head

* Cited in next note.

† FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift, 1849, Bd. IV, S. 142—appears to have regarded erysipelas as an epiphenomenon of dysentery, remarking that it seldom occurs before the 10th day of that disease; the face or lower extremities were most frequently affected. He mentions also the occurrence of an erythema of 3–6 days' duration, which especially attacked the front of the neck and breast, and came and went without any noteworthy symptoms. I have never observed an example of this accident. GRIESINGER—*Krankheiten von Egypten*, Abs. X, Cap. 2, Archiv für phys. Heilk., Jahrg. XIII, 1854, S. 542—observed two cases of gangrenous erysipelas of the face in patients suffering with Egyptian dysentery.

and face was most apt to be affected. The vast numbers of patients suffering under diarrhœa or dysentery, of course, afforded fit subjects for such epidemics; so also did the fever patients, and those suffering from pneumonia and other phlegmasiæ. I know of nothing to indicate that the former class was more susceptible than the latter.

*Paralysis as a sequel to dysentery.*—Paralysis of one or more limbs is an occasional sequel to dysentery, which was several times observed during the civil war, although it was far from attracting the attention it deserved. I note that 2,907 soldiers were reported to have been discharged the service during the war on account of paralysis, and 272 deaths were attributed to the same cause; but there are no means of ascertaining what proportion of these occurred in connection with dysentery. I find in the records but one report of a case in which acute dysentery was succeeded by paralysis, and nine in which it was consecutive to "chronic diarrhœa" so-called: two of the latter cases will be found in Section III, viz: cases 569 and 819. In case 569 the patient died of a subacute flux of about three months' duration. While under treatment for this disease, and about a month before his death, "he had an attack of paraplegia, which, after several days, confined itself to the right lower extremity." He died much emaciated. In case 819 the right arm became paralyzed about a week before death, and the right lower extremity a few days later. I subjoin the remaining cases. In case 884 the paralysis followed acute dysentery; it might seem proper to postpone the others, in which it occurred during "chronic diarrhœa," until the fluxes of that character have been treated of, but it seems more convenient to complete the discussion of the subject in this place:

Case 884.—Private Isaac N. Cook, company I, 16th Kentucky infantry; age 26; admitted to general hospital, Quincy, Illinois, February 15, 1863, with rheumatism. This man was originally admitted to hospital No. 6, Louisville, Kentucky, August 12, 1862, suffering from intermittent fever. September 11th, he was transferred to hospital No. 7, Louisville, where the diagnosis recorded on the register was jaundice. From this hospital he was sent to Quincy. He was treated at Quincy for rheumatism and cough until March 5, 1864, when he was attacked by severe mucous dysentery with bloody, slimy stools. This lasted ten days, and then terminated in convalescence. He, however, remained unable to leave his bed, and his attending physician recognized evidences of partial paralysis of his lower extremities. He was treated with tonics, and had moxas applied to his lumbar region without benefit; and May 28th, was discharged the service on surgeon's certificate of disability.—Acting Assistant Surgeon F. K. Bailey.

Case 885.—Private Charles Irish, company K, 6th Ohio cavalry; age 40; was admitted to 2d Division general hospital, Alexandria, Virginia, June 15, 1864. Diagnosis, chronic rheumatism. Transferred to Philadelphia, June 20th. Admitted to Summit House hospital, Philadelphia, June 21st; same diagnosis. Transferred to Satterlee hospital August 24th; same diagnosis. Transferred to Turner's Lane hospital. Admitted to Turner's Lane hospital, Surgeon R. A. Christian, U. S. V., in charge, October 20th. Diagnosis, partial paralysis of the lower extremities. The case-book of the hospital gives the following particulars: This man had typhoid fever eight or nine years ago, followed by enfeeblement of the limbs, in consequence of which he was unable to walk for months. He says his limbs were never so strong again; nevertheless, he was well enough to enlist April 4, 1864, and was sent at once to the field. Six weeks after enlistment he was attacked by dysentery, which was followed by his present trouble. He is now unable to walk, and complains of a feeling as if a rope were tied tightly around his hips; sensation is less impaired than motion; he feels a touch on the legs, but does not perceive painful impressions as distinctly on the lower as on the upper extremities. The record shows that this man was discharged the service December 21st, because of "partial paralysis of the lower extremities."

Case 886.—Private Martin Burley, company F, 2d Pennsylvania cavalry; age 29; admitted to Douglas hospital, Washington, D C., May 10, 1864. Diagnosis, dropsy. Transferred to Philadelphia, Pennsylvania, May 14th. Admitted to Mower hospital, Philadelphia, May 15th. Diagnosis, general debility. Transferred, February 11, 1865. Admitted to Turner's Lane hospital, Surgeon R. A. Christian, U. S. V., in charge, February 11th. Diagnosis, partial paraplegia. The case-book of the latter hospital states that this man enlisted February 13, 1862; was first taken with diarrhœa at Occoquan creek, Virginia; it continued five months. He was furloughed for sixty days about two months after being taken ill, but was not well enough to return to his regiment when the furlough expired. While on furlough the diarrhœa ceased, but soon after his lower extremities, especially the left, became partially paralyzed. He went to Washington about six months after he received his furlough, and was admitted to Douglas hospital as above stated. At present his lower limbs are so feeble that he can only walk with crutches. Muscular contractility and sensation appear to be good in both limbs, but the left leg is feeble and three-quarters of an inch smaller round the calf than the other. His general health is apparently good. This man was discharged from the hospital by reason of expiration of term of service, March 3, 1865. His condition at that time was much improved.

CASE 887.—Private Charles L. Eastman, company K, 99th Illinois infantry; age 20; was admitted to general hospital, Quincy, Illinois, August 26, 1863, with diarrhœa. The following particulars are from the case-book of the 3d Division, Acting Assistant Surgeon F. K. Bailey in charge: The patient said he had suffered from diarrhœa from June, 1862, till very lately; is now emaciated; tongue coated, but appetite good. Ordered pills of sulphate of cinchona and sulphate of iron. September 4th: Complains of difficulty of speaking. September 10th: Complains of slight stiffness of the lower jaw and difficulty of opening the mouth. September 14th: Complains of coldness and a pricking sensation in the lower extremities. September 23d: A sense of numbness in the lower extremities, and difficulty in guiding them now supervene. October 8th: Numbness and pricking sensation continue; speech is difficult, and the voice sounds as though the mouth were full of food. Substitute for the former treatment: ℞. Arsenious acid and strychnia, of each 2 grains, extract of gentian q. s.; make 30 pills; take one at each meal. October 15th: Is somewhat better. He continued to improve till the 25th, when the paralytic symptoms became worse again, although it is noted on the 29th that his general health is improving. November 7th: Improvement is again noted, and continued until the patient returned to duty cured, February 16, 1864. The strychnia and arsenious acid were discontinued November 20th. This man had no looseness of the bowels after his admission to hospital.

CASE 888.—Private Abraham Mansfield, company G, 128th Ohio volunteers, was admitted to Lawson hospital, Saint Louis, Missouri, Surgeon C. T. Alexander, U. S. A., in charge, March 21, 1863. The case-book of the hospital states that he had been sick for three months with a bad cold, rheumatism and diarrhœa; was taken on board the hospital boat two weeks ago; had previously recovered from the diarrhœa, but had gradually lost the use of his lower limbs; at present, however, he complains of loss of power only from the knees down; his general health appears to be good. April 16th: The case-book reads: "Am inclined to think patient is playing old soldier; he only gets out of bed when ordered; complains that he has no use of his limbs; claims that he has been injured, but cannot tell how it was done." This suspicion, however, was erroneous, for the record concludes: Died, May 2, 1863. The cause of death given in the hospital register is chronic diarrhœa.

CASE 889.—Private Hayden Ogden, company I, 17th Indiana volunteers; age 24; admitted to the Marine hospital, New Orleans, Louisiana, September 12, 1863, with paralysis of the left lower extremity. He stated that he was attacked with a severe diarrhœa about ten months since, which lasted for four months, when he lost both sensation and motion in his left thigh and leg; the diarrhœa continued for two months longer, when typhoid fever set in, from the effects of which he is still in a very prostrate condition. Strychnia was tried without benefit, and the patient was discharged the service on surgeon's certificate of disability, October 8, 1863.—Acting Assistant Surgeon Wm. Cleary.

CASE 890.—Private Peter Harting, company E, 52d New York volunteers; age 26; was admitted to 1st Division Annapolis hospital, March 9, 1864, with partial paralysis of the legs. He stated that he was taken prisoner at Bristow Station, October 14, 1863, and confined at Belle Isle. He was then in good health, but soon began to suffer from diarrhœa, which continued, alternating with constipation, during his imprisonment. After a time his legs began to swell and he partially lost the use of them. At present he can use them much better. No treatment was employed except good diet and local frictions. April 9th, being much improved, he was transferred to the hospital at Annapolis Junction, and thence, April 26th, to Camp Parole as a convalescent.—Acting Assistant Surgeons S. J. Radcliffe and F. M. Lincoln.

CASE 891.—Corporal William H. Smith, company K, 77th New York volunteers, was admitted to McKim's Mansion hospital, Baltimore, Maryland, June 17, 1863, with paraplegia. He stated that about the first of February he was admitted to regimental hospital at White Oak Church, Virginia, suffering with chronic diarrhœa and rheumatism. About the last of February he lost the use of his lower limbs, and has been unable to walk ever since. He attributed this accident to having "taken cold," or to injuries received at one time to the left hip, at another to the left leg, prior to enlistment, from which he supposed he had recovered. He was subsequently transferred to the hospital at Potomac creek, and afterwards to Lincoln hospital, Washington, whence he came to McKim's Mansion. In this case the magneto-electric machine was used, but only with "slight benefit," and the patient was discharged the service on surgeon's certificate of disability, August 24th.—Acting Assistant Surgeon William G. Smull.

I cannot doubt that a number of similar cases occurred, the particulars of which were not reported. On this subject we have the valuable testimony of Dr. S. Weir Mitchell,* who enjoyed special opportunities for observation at the Army Hospital for Diseases of the Nervous System, in Philadelphia. He explicitly states that in the wards of that hospital he saw "many cases of palsy, chiefly paraplegia, following upon dysentery, acute or chronic."

The occasional occurrence of paralysis in connection with dysentery has long been a matter of observation. It was known to Galen,† who attributed it to the injudicious suppression of the discharges by rash medication. His statement was repeated by many

* S. WEIR MITCHELL—*Paralysis from peripheral irritation, with reports of cases*, New York Med. Jour., Feb., 1866, p. 333. He adds the following important remarks: "But in nearly every case there had been many possible causes, such as long marches, bad diet, malaria or injuries to the spine—these being so common that almost any patient long in service had some such to relate. It was thus difficult, or even impossible, to fix upon any single factor as most important or essential, where, as in the mass of cases, it was likely that several contributed to influence the final result."

† GALEN—*De venæ sectione adversus Erasistratum Liber*, Cap. 6 *ad fin.*, [Ed. Kühn, XI. p. 170.] The passage refers to the suppression of the discharges of hæmorrhoids as well as of dysentery, and the evil effects enumerated are melancholia, insanity, pleurisy, nephritis, vomiting of blood, hæmoptysis, paraplegia and dropsy.

subsequent writers;* and according to Jaccoud,† Fabricius Hildanus (1641) published the particulars of a case of paraplegia following a severe attack of acute dysentery in a young man. The first attempt at a detailed discussion of the subject, however, is the dissertation of Conrad Fabricius,‡ published in 1750. According to him paralysis is most apt to follow epidemic dysentery, generally affects one arm and the opposite leg. and is often accompanied by pains in the joints. Following the opinion of Galen, he attributed it to the premature suppression of the flux by the use of opiates and astringents. This dissertation was republished by Haller, and the form of paralysis it described was accepted by Sauvages § as a species under the designation "hemiplegia transversa." Zimmermann ‖ observed a number of cases of paralysis following dysentery during the Swiss epidemic of 1765, but offered no explanation of their cause. John Peter Frank¶ spoke of it as an occasional accident after dysentery, compared it to the paralysis which occurs in lead colic, and believed its occurrence to be due to unusual intensity of the abdominal pains.

In more recent times a number of cases have been published in detail, among which those of Zabriskie, Moutard-Martin, Gallard, Gubler, Thomas and Leyden** may be particularly referred to. The subject has been discussed quite fully by a number of writers, especially by Gubler, Jaccoud, Mitchell, Barrallier and Leyden.†† The interpretation most generally accepted at the present day is that which explains these cases as examples of reflex paralysis;‡‡ while Leyden assumes a direct extension of the inflammatory process which exists in the rectum in dysentery to the sacro-lumbar plexus, and explains the paralysis by the resulting neuritis and consecutive lesions in the spinal cord.

Other theories have been offered,§§ but it would be foreign to my present purpose to discuss them. The cases that I have found in literature, like those collected during the civil war, which I have presented above, appear to me to be too imperfectly observed to warrant a conclusion. Jaccoud has well remarked that it would be wise to wait, before building a theory on this subject, until medical science possesses at least *one* complete observation,‖‖ and this implication of incompleteness applies to the cases recorded since his time as well as to those observed previously. The assumption that in these cases no lesion exists in either the brain or spinal cord because none has been observed, must be acknowledged to be a

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* Some of these are enumerated by D. W. TRILLER—*Diss. de tumoribus subitis a dysenteria intempestive suppressa obortis*, Wittemberg, 1771; I cite Opusc. Med., Frankfort, 1766, T. III, p. 145—who mentions a number of other lesions attributed to the same cause by various authors.

† S. JACCOUD—*Les paraplégies et l'ataxie du mouvement*, Paris, 1864, p. 413. His reference is merely: "Fab. de Hilden. Obs. et cur. chir. centuriæ VI," without farther particulars; and I have not been able to identify the case referred to.

‡ P. C. FABRICIUS et J. G. A. KIPPING—*De paralysi brachii unius et pedis alterius lateris dysentericis familiori*, Helmstadt. 1750; I cite from the reprint in HALLER'S *Disp. ad Morb. Hist. et Cur.*, Lausanne, 1757, T. I, p. 97.

§ SAUVAGES—*Nos. Meth.*, Amsterdam, 1768, T. I, p. 793. SAUVAGES simply adopted the description of CONRAD FABRICIUS. I cannot, therefore, agree with the remark of BARRALLIER, [*loc. cit., infra:*] "Sauvages a aussi constaté la fréquence de cette forme."

‖ ZIMMERMANN—*Von der Ruhr unter dem Volke im Jahr* 1765, Zurich, 1767, S. 142 *et seq.* He observed especially paralysis of the lower limbs, and general paralysis. In the French translation of this work, Paris, 1812, p. 12, by a curious blunder the expression "ein Auschlag," (an eruption,) applied to a rash sometimes observed in the mouth, on the tongue, the abdomen, or over the whole body, Chap. 2, p. 14, is erroneously translated "une paralysie," an error perpetuated by GUBLER, (*infra*, note **,) who cites this translation.

¶ J. P. FRANK—*De Cur. Hom. Morb. Epitome*, Milan Edit., 1832, T. III, p. 437—"Tantum vero ad gradum doloris in abdomine vehementia apud hos vel illos evehitur; ut ab eo non minus, ac in *colica saturnina*, brachii aut pedis unius vel alterius paralysis sequatur."

** J. B. ZABRISKIE—*On paralysis sympathetic of visceral disorders*, Amer. Jour. of the Med. Sciences, Oct., 1841, p. 361—two cases following dysentery. MOUTARD-MARTIN—*Paroplégie, suite de dysenterie*, L'Union Médicale, Oct., 1852, pp. 492 and 504—case observed in the Hôtel-Dieu in 1849. GALLARD—*Dysenterie avec accidents cérébraux*, idem, Sept., 1859, p. 547—one case observed at the Lariboisière. A. GUBLER—*Des paralysies dans leur rapports avec les maladies aiguës*, etc., Archiv. Gén. de Méd., March, 1860, p. 267—has a section on paralysis in dysentery, in which he gives the particulars of three cases. T. GAILLARD THOMAS—*Clinical lecture on paraplegia*, Amer. Med. Monthly, June, 1862, p. 401—one case, (No. 4.) E. LEYDEN—*On reflex paralysis:* translated in Clinical Lectures, &c., New Syd. Soc., London, 1876, p. 145—one case. Paralysis has also been observed to follow other intestinal inflammations; see, for example, the cases of paraplegia consecutive upon enteritis reported by R. J. GRAVES—*Clinical Lectures*, Amer. Edit., Philadelphia, 1838, p. 76.

†† See the references to GUBLER, JACCOUD, MITCHELL and LEYDEN in previous notes; also A. BARRALLIER—Art. *Dysenterie*, Nouveau Dict. de Méd. et de Chir. Prat., T. XI, Paris, 1869, p. 747.

‡‡ The chief apostle of this view is undoubtedly BROWN-SÉQUARD—*Lectures on the physiology and pathology of the central nervous system; delivered at the Royal College of Surgeons of England in May*, 1858. Philada., 1860, p. 164—Paralysis and anæsthesia by a reflex action.

§§ As for example by GUBLER, cited above. ‖‖ *Loc. cit.*

mere assumption, in view of the readiness with which minute structural changes might be overlooked in the absence of microscopical examination, which has not yet been resorted to in a systematic manner. In like manner the assumption by Leyden of some local lesion in the great nerve trunks proceeding to the lower extremities, lacks the support of actual anatomical observations so far as dysenteric paralysis is concerned.

The comparison made by Frank between these cases and lead colic has been repeated by Barrallier,* who affirms that in dysenteric paralysis the extensor muscles are particularly affected. I do not wish to give undue importance to the suggestion, but would remark that it has occurred to me that some, at least, of the cases reported as dysenteric paralysis may have been really due to lead poisoning. Setting aside the possibility of the accidental coexistence of lead poisoning from its usual causes, the use of the acetate of lead in the treatment of the disease may be pointed out as a probable source of this complication. Medical Inspector Mussey† reports that in 1863 he observed a case of dysentery followed by lead colic due to this cause in the hospital of the 3d New York cavalry in North Carolina. I fear the accident occurs much more frequently than is generally suspected; and of course paralysis is as prone to follow lead poisoning induced in this way as in any other.‡ I by no means, however, offer this hint as more than a possible explanation of some of the cases. I may add that while engaged in writing this paragraph, an interesting illustration of the actual occurrence of lead paralysis from the injudicious employment of acetate of lead in the treatment of dysentery, was communicated to me by my colleague, Dr. G. A. Otis. I subjoin an abstract of the case in a foot-note.§

In this instance the upper extremities only were affected, as in the majority of the cases of paralysis from lead poisoning; while in the majority of the cases of paralysis following dysentery the lower extremities only are involved, and this I presume to be a satisfactory proof, if any were needed, that the maladministration of lead cannot be held responsible for more than a part of the dysenteric cases; but it must not be forgotten that on the one hand dysenteric paralysis may affect the upper extremities as well as the lower, or, indeed, the upper extremities only, while on the other hand lead paralysis not only may affect the lower extremities as well as the upper, but has been known to manifest itself in some instances in the lower extremities alone.‖

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* *Loc. cit.* † *Supra*, p. 79.

‡ S. EUGALENUS—*De Morbo Scorbutico, Liber*, [1588:] I cite the Amsterdam Ed. of 1720, p. 73—reports two cases of colic terminating in paralysis which he supposed to be accidents of scurvy. I think it likely enough that these were cases of lead poisoning, as has been suggested by ADAMS with regard to the paralysis supervening upon colic described by PAULUS ÆGINETA, Lib. III, Sect. 18, Transl. of Syd. Soc., Vol. I, London, 1841, p. 396. Dr. ADAMS remarks, p. 401: "The paralysis of the extremities after colic, mentioned by our author, and after him noticed by Avicenna and Haly-Abbas, was, no doubt, the same disease as the palsy after colica pictonum described by modern authors."

§ In the spring of 1865, two Catholic priests called at the Surgeon General's Office to make inquiries about a wounded man. This business concluded, Dr. OTIS, of whom the inquiries were made, remarking that one of the priests (Padre E———, aged about 50) presented a very striking example of "dropped wrists," observed: "I fear you are suffering from the effects of lead poisoning." The good man raised his eyes heavenward, and spoke of the affliction as a discipline designed by Providence for his benefit; but he asked for advice in the matter; and, on examination, it appeared that during the preceding summer, while on missionary duty in New England, he suffered, in a country village, from a severe attack of dysentery. While disapproving of "allopathy," he employed the only local practitioner; and, as appeared in the sequel, was treated, among other remedies, by pills, each containing a grain of opium and two grains of acetate of lead in some aromatic confection. A chronic flux persisted for some weeks after he had resumed his journey, and he continued for several months to have recourse to these pills, which he had found greatly to relieve his discomfort. After a time he became much emaciated, and in the winter loss of power in the extensors of the fingers, wrist and forearm appeared, and augmented until his hands were almost useless. He had been for several months prior to his visit to Washington under the care of homœopathic practitioners in Worcester and Boston, who pronounced the symptoms dependent on some centric lesion of the nervous system and probably incurable. It was thought that the affection was unmistakably due to saturnine poisoning. The padre was advised to take full doses of iodide of potassium and the sulphuric acid *limonade* of the French physicians, and also to resort to frictions and Faradization over the extensors of the forearm. He pursued this treatment, and his complete recovery ensued within three months—and was described by him as miraculous.

‖ Consult TANQUEREL DES PLANCHES—*Traité des Maladies de Plomb, ou Saturnines*, Paris, 1839—which, I regret to say, is only represented in the library of the Surgeon General's Office by the *Abridgment* of S. L. DANA, Lowell, 1842. See also C. PH. FALCK—*Die klinisch wichtigen Intoxicationen*, in Virchow's Handb. der Spec. Path. und Ther., Bd. II, Abth. 1, Erlangen, 1855. According to TANQUEREL, of 113 cases of paralysis of the extremities, the lower extremities were involved in 15, and in 5 the disorder was limited to the lower extremities, the superior preserving all their motions.—*Abridgement*, p. 216; compare FALCK, *op. cit.*, S. 201.

*Other complications of acute dysentery.*—Various other complications of dysentery may be mentioned, such as pericarditis, endocarditis, diphtheritic exudation on the mucous membrane of the pharynx or larynx, etc. Finger and Trousseau* have observed inflammation of the parotids in the advanced stages of severe cases, a fact which should not be overlooked in attempting to diagnosticate between dysentery and fever, when the case is first seen in its latter stages, without satisfactory previous history, as so often happens in hospital practice during times of war. Cases of this complication have been reported in the United States by Minor, Strong and White.† Bedsores occasionally occur, as in case 132, but this complication is very rare, even in chronic dysentery.

Influence of Region on the prevalence of Dysentery in the United States.—In the first section of this chapter, for reasons then fully explained, the statistics of diarrhœa and dysentery were discussed together. I have, however, deemed it advisable to add in this place a few ratios deduced from the number of cases of acute dysentery separately reported. As might be expected, the distribution of these cases closely agrees with that given in Section I for the whole group. They were proportionally more numerous in the Atlantic region than in the Pacific, in the Central region than in either, and in both Atlantic and Central regions they were more numerous in the southern than in the northern portions, as is shown by the following tables:

*Tabular statement of the prevalence of Acute Dysentery among the White troops, expressed in ratio per 1,000 of mean strength.*

*Atlantic Region.*

| Departments. | Year ending June 30, 1862. | Year ending June 30, 1863. | Year ending June 30, 1864. | Year ending June 30, 1865. |
|---|---|---|---|---|
| Department of the East | ..... | 36 | 29 | 31 |
| Middle Department | 47 | 48 | 46 | 57 |
| Department of the Shenandoah | 73 | ..... | ..... | ..... |
| Middle Military Division | ..... | ..... | ..... | 71 |
| Department of Washington | ..... | 63 | 69 | 71 |
| Army of the Potomac | 103 | 92 | 56 | 69 |
| Department of Virginia | 36 | 111 | 116 | 99 |
| Department of North Carolina | 122 | 91 | 88 | 88 |
| Department of the South | 155 | 109 | 139 | 108 |

* Finger—S. 145, *op. cit.*, p. 405, *supra.* Trousseau—*Clinique Méd. de L'Hôtel-Dieu*, 2me Ed., Paris, 1865, T. III, p. 163.

† G. G. Minor—*A case of dysentery complicated with parotitis*, The Virginia Med. Jour., Vol. XII, 1859, p. 191. The patient was a boy 12 years old, who died on the 16th day of sporadic dysentery. The left parotid first enlarged two days before death; next day the right. The swelling was so great as to render deglutition impossible. The boy had previously had mumps. In the *Minutes of the Proceedings of the Buffalo Med. Association*, Buffalo Med. Jour., Vol. X, 1854–5, p. 405, I find several cases, viz: One reported by Dr. Strong: A lady, 30 years old, who had an apparently slight attack of dysentery and appeared to convalesce on the fifth day, when parotitis made its appearance on one side, (it is not stated which;) three or four days later the tumor discharged a thin, ichorous, purulent matter at the ear. Soon after the dysentery recommenced, was uncontrollable, and the patient died; before death the opposite parotid had begun to enlarge. Dr. White said he had witnessed three similar cases: one in 1853, the dysentery was severe, and just as it subsided the left parotid enlarged; no suppuration took place, nor did the dysentery return, but the patient died. He had seen in 1849 a young girl, and in 1852 a child of 7 years, die under similar circumstances. In all these cases the tumor is spoken of as of "a peculiar stony hardness;" all had taken acetate of lead, and Dr. White suggested that this might be the cause, as "Lead, more than any other drug, affects the secretion of saliva, checking it, and making the mouth dry." Dr. Wyckoff had seen a similar enlargement in the submaxillary gland after a mild case of dysentery in a boy who had not taken lead; he recovered.

*Central Region.*

| Departments. | Year ending June 30, 1862. | Year ending June 30, 1863. | Year ending June 30, 1864. | Year ending June 30, 1865. |
|---|---|---|---|---|
| Department of the Northwest | 51 | 33 | 93 | 138 |
| Northern Department | ..... | 60 | 65 | 74 |
| Department of West Virginia | 141 | 78 | 58 | ..... |
| Department of the Missouri | 102 | 93 | 82 | 126 |
| Department of the Ohio | ..... | 58 | 95 | ..... |
| Department of the Cumberland | 147 | 142 | 117 | ..... |
| Department of the Tennessee | 171 | 158 | 168 | ..... |
| Military Division of the Mississippi, Part I | ..... | ..... | ..... | 116 |
| Military Division of the Mississippi, Part II | ..... | ..... | ..... | 126 |
| Department of Arkansas | ..... | ..... | 148 | 200 |
| Department of the Gulf | 299 | 110 | 135 | 177 |

*Pacific Region.*

| Year ending June 30, 1862. | Year ending June 30, 1863. | Year ending June 30, 1864. | Year ending June 30, 1865. |
|---|---|---|---|
| 54 | 53 | 30 | 28 |

*Tabular statement of the prevalence of Acute Dysentery among the Colored troops, expressed in ratio per* 1,000 *of mean strength.*

| Region. | Year ending June 30, 1864. | Year ending June 30, 1865. |
|---|---|---|
| Atlantic | 124 | 132 |
| Central | 178 | 154 |

The mortality followed the same law. It was greater in the Central region than in the Atlantic, and in this than in the Pacific region, as is shown by the following table:

*Tabular statement of the mortality of Acute Dysentery, expressed in ratio per* 1,000 *of mean strength.*

| WHITE TROOPS. | | | | | COLORED TROOPS. | | |
|---|---|---|---|---|---|---|---|
| Region. | Year ending June 30, 1862. | Year ending June 30, 1863 | Year ending June 30, 1864. | Year ending June 30, 1865. | Region. | Year ending June 30, 1864. | Year ending June 30, 1865 |
| Atlantic | .51 | .85 | .86 | .95 | Atlantic | 1.75 | 2.85 |
| Central | 2.36 | 2.07 | 2.47 | 2.81 | Central | 14.85 | 8.58 |
| Pacific | ..... | .32 | .10 | .31 | ..... | ..... | ..... |

Undoubtedly, also, in the Atlantic and Central regions the disease was more fatal in the southern than in the northern departments, although, for the reasons given in Section I,

it is impossible to give this circumstance any definite numerical expression. This geographical distribution of cases and mortality agrees substantially with the experience of the United States Army during many years of peace, and if the geographical distribution of dysentery among the civil population of the country were similar, these facts would create a strong presumption in favor of the belief that malaria plays the part of a direct cause in the development of the disease. But it has been too hastily assumed that the prevalence of particular diseases in the military garrisons of a country may be regarded as a trustworthy indication of their endemic prevalence among the civil population; and in the case under consideration it is easy to bring forward facts which contradict the inferences which have been drawn from this assumption.

Among the most eminent of the writers who have fallen into this error with regard to the occurrence of dysentery in different parts of the United States is Hirsch,* who, in his elaborate work on geographical pathology, has arrived at the conclusion that dysentery prevails endemically only in the southern and southwestern portions of our country, especially at certain points on the southern Atlantic and Gulf coasts and along the banks of the Mississippi, Arkansas and other great streams within the region in question. He based his statement in part upon the silence of American medical writers with regard to the endemic occurrence of dysentery in the northern portions of the United States; in part upon the local observations of a few writers, especially Tidyman, Evans, Little, Wright, Chalmers, Porter, Cooke and Stinnecke,† whose utterances, however, he seems to regard rather as illustrative instances confirmatory of his views than as data satisfactorily establishing them; but chiefly he relies upon the army statistics of Forry‡ and Coolidge,§ of which he speaks as affording the only comprehensive testimony on the subject, and certainly these works appear to justify his conclusions.

In appreciating their testimony, however, it must not be forgotten that they both refer to the little army of the United States only, and not to the civil population. The rank and file of that army, during the period represented, was chiefly recruited in the northern States, and to a very considerable extent from men of foreign birth, and the

* A. HIRSCH—*Handbuch der historisch-geographischen Pathologie*, Bd. II, Erlangen, 1862–4, S. 207.

† P. TIDYMAN—*Diseases of the negroes of the Southern States*, Philadelphia Jour. of the Med. and Phys. Sciences, Vol. XII, 1826, p. 306; J. P. EVANS—*Obs. on the diarrhœa of the South*, Charleston Med. Jour. and Review, Vol. VI, 1851, p. 309; R. E. LITTLE—*Climate, diseases, &c., of Middle Florida, particularly of Gadsden County*, Amer. Jour. of the Med. Sciences, Vol. X, 1845, p. 65; J. J. B. WRIGHT, Asst. Surgeon U. S. A., Amer. Med. Intelligencer, Vol. I, N. S., 1841, p. 113, in an account of the diseases at Fort Gibson, Ark.; L. CHALMERS—*Weather and diseases of South Carolina*, London, 1776, Vol. II, p. 31; J. B. PORTER, Surgeon U. S. A.—*On the climate and salubrity of Fort Moultrie and Sullivan's Island, Charleston Harbor*, Amer. Jour. of the Med. Sciences, Vol. XXXII, 1856, p. 347; J. E. COOKE—*Essay on autumnal diseases*, Transylvania Jour. of Med., Vol. I, 1828, p. 339; H. A. STINNECKE—*Med. topography and diseases of Fort Monroe*, in COOLIDGE's Statistical Report from 1839 to 1855, [cited below,] p. 139. Of these citations it may be remarked that WRIGHT and STINNECKE were speaking of certain military garrisons, not of the civil population, so that the subsequent remarks in the text apply to their observations. I do not understand PORTER to affirm any special prevalence of dysentery among the citizens of Charleston. COOKE mentions an epidemic of dysentery in Fauquier county, Va., in 1816, and regards it as "another form of autumnal fever," *op. cit.*, p. 493–5; CHALMERS speaks of it as frequent in South Carolina; LITTLE in Florida, and TIDYMAN among the negroes of the southern States; but none of these writers bring forward any numerical facts which show that dysentery was more frequent in the region of which he wrote than in other parts of the United States, or even express a definite opinion to that effect. The most striking confirmation of the view of HIRSCH is to be found in the paper of EVANS; but a portion of the facts it contains were furnished by the military experience of the Mexican war, while the rest, for the most part, refer to the prevalence of the disease throughout the south and southwest for several years before the paper appeared [1851]—a period during which I shall presently show dysentery prevailed epidemically in all parts of the United States. To the paper of WRIGHT, cited above, on dysentery at Fort Gibson, I may add one on the same subject by L. C. MCPHAIL, U. S. A.—*Medical topography*—No. 10, American Med. Intelligencer, Vol. I, 1837–8, p. 412.

‡ S. FORRY—*The Climate of the United States and its Endemic Influences*, 2d Ed., New York, 1842, p. 298. The medical statistics of this interesting work were derived from the *Statistical Report on the Sickness and Mortality in the Army of the United States, from January, 1819, to January, 1839*, Washington, 1840; a work edited by Dr. FORRY himself, then an Assistant Surgeon in the army.

§ R. H. COOLIDGE—*Statistical Report on the Sickness and Mortality in the Army of the United States, from January, 1839, to January, 1855*, Washington, 1856; and *Statistical Report on the Sickness and Mortality in the Army of the United States, from January, 1855, to January, 1860*, Washington, 1860. The latter report is not cited by HIRSCH. I may add that HIRSCH frankly admits the incomplete character of the information at his disposal, and questions how far dysentery is habitually endemic in the southern States, citing in illustration the paper of J. W. HEUSTIS—*Climate, &c., of the middle section of Alabama, more especially in relation to the county of Dallas*, Amer. Jour. of the Med. Sci., Vol. VIII, 1831, p. 93—who states that in that district dysentery seldom occurs except among invalids and convalescents; and that of G. R. GRANT—*Sanitary condition, &c., of Memphis, Tenn.*, Amer. Jour. of the Med. Sci., Vol. XXVI, 1853, p. 107—who affirms that dysentery only occurs sporadically in that city; a statement which ignores the epidemics of 1846 and 1847; see the paper of J. E. STEWART—*Epidemic dysentery*, The Missouri Med. and Surg. Jour., Vol. III, 1848, p. 145.

system of changing stations every few years, which still prevails, brought constantly fresh portions of the force into the southern and southwestern regions. Under these circumstances the relations of the soldiers to the climatic conditions of the regions in question was essentially that of strangers, and it is not surprising that the army statistics represent a distribution of dysentery which approximates rather to what happened during the civil war than to its distribution among the civil population in years of peace. Neither the work of Forry, nor the army statistical report upon which it was based, give the facts with regard to dysentery separately from diarrhœa; but Forry has compiled from the statistics of the army for ten years an interesting table showing the ratio of the two diseases to strength in the posts of certain regions, an abstract of which is appended in the foot-note.*

He shows further that in the whole northern division, for the period in question, the average annual ratio of cases was 269 per 1,000 of strength; in the middle and southern, 526. In the former the annual mortality was 0.4 per 1,000 of strength, in the latter 3.7. So that the proportion of cases was about twice greater, and that of deaths about nine times greater, in the southern than in the northern portion of the United States. It is not remarkable that upon the basis of these facts Forry should have classed diarrhœa among the malarial diseases.† The more extensive and elaborate statistical reports of Coolidge indicate a distribution of diarrhœa and dysentery among the military posts of the northern and southern portions of the United States which approximates in its main features that pointed out by Forry. In these reports dysentery and diarrhœa are separated. Hirsch‡ has prepared from the first of them a table which shows the ratio of cases and deaths from dysentery to strength in each of the groups into which Coolidge distributed the several military posts; I observe that it does not contain the deaths from diarrhœa, nor does it embrace the figures of the second report of Coolidge, [1855 to 1859, inclusive.] I therefore subjoin a similar table § in which both these deficiencies are supplied.

* *Diarrhœa and Dysentery* in the United States Army, 1829–38 inclusive, giving the annual ratio of cases per 1,000 of mean strength.

| Northern Division. | Ratio. | Middle Division. | Ratio. | Southern Division. | Ratio. |
|---|---|---|---|---|---|
| Posts on the coast of New England.... | 170 | Coast from Delaware Bay to Savannah | 455 | Posts on the lower Mississippi ..... ... | 456 |
| Posts on northern chain of Lakes ..... | 253 | Southwestern stations..... | 597 | Posts in the Peninsula of East Florida | 495 |
| Posts remote from the ocean and inland seas. | 305 | | | | |

† *Op. cit.*, p. 293. ‡ *Op. cit.*, Bd. II, S. 208.

§ *Diarrhœa and Dysentery* in the United States Army, 1839–59 inclusive, giving the annual ratio of cases and deaths.

| Region. | Period represented in years. | Diarrhœa. | | Dysentery. | | Region. | Period represented in years. | Diarrhœa. | | Dysentery. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. | | | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. | Ratio of cases per 1,000 of strength. | Ratio of deaths per 1,000 of strength. |
| Coast of New England..... | 21, (1839–59.) | 128 | .46 | 78 | .22 | South Interior Region, East.. | 21, (1839–59.) | 390 | 4.21 | 176 | 4.36 |
| New York Harbor ..... | " | 514 | 1.40 | 81 | 2.02 | South Interior Region, West.. | " | 269 | 1.22 | 125 | 3.01 |
| North Interior Region East of Great Lakes | 16, (1839–54.) | 168 | .56 | 33 | ..... | Atlantic Coast of Florida.... | 11, (1849–59.) | 637 | ..... | 187 | 3.27 |
| Region of Great Lakes..... | 21, (1839–59.) | 237 | 1.21 | 28 | .37 | Interior and Gulf Coast of Florida. | " | 602 | 3.30 | 213 | 4.32 |
| North Interior Region West of Great Lakes. | " | 284 | 1.15 | 62 | .91 | Southern frontier of Texas... | " | 418 | 7.93 | 146 | 3.83 |
| | | | | | | Western frontier of Texas.... | " | 312 | 2.81 | 149 | 2.50 |
| Middle Atlantic Region..... | " | 252 | 1.90 | 99 | .95 | New Mexico ..... ..... | " | 290 | 1.34 | 65 | 1.71 |
| Carlisle Barracks and Allegheny Arsenal. | " | 562 | .53 | 92 | .26 | Utah Territory ..... | 2½, (1857–9.) | 319 | .34 | 46 | .34 |
| | | | | | | California, Southern Division | 11, (1849–59.) | 264 | 2.59 | 58 | 2.33 |
| Newport Barracks, Ky..... | 13, (1847–59.) | 481 | 3.64 | 53 | 2.02 | California Northern Division. | " | 276 | 2.85 | 56 | 2.60 |
| Jefferson Barracks & St. Louis Arsenal, (recruits chiefly.) | 21, (1839–59.) | 700 | 9.20 | 224 | 3.74 | Oregon and Washington Territory. | " | 217 | .11 | 73 | .78 |
| Middle Interior Region, West | " | 449 | 1.86 | 86 | 1.14 | | | | | | |
| South Atlantic Region, chiefly Charleston Harbor. | " | 324 | 2.06 | 109 | .88 | | | | | | |

In a general way this table shows both diarrhœa and dysentery to have been more frequent and more fatal at the military posts in the southern than at those in the northern portions of the United States. Still, even in these military statistics some striking exceptions occur. Thus, the greatest proportion of cases of dysentery occurred at the posts in the vicinity of St. Louis, Missouri, where the malarial influences must be regarded as quite mild when compared with some of the southern districts in which the ratio of cases was much smaller. The ratio of deaths at the same posts, though not the largest, is still much larger than in several of the more malarial districts. The remarkable prevalence and mortality of diarrhœa at these posts is also worthy of consideration. Indeed the mortality of diarrhœa in several of the districts is so great as to suggest the probability that a considerable proportion of the cases reported as diarrhœa were really dysentery.

If the data from which the foregoing table was compiled are grouped in such a way as to contrast the posts in the northern portion of the United States east of the Rocky Mountains with those in the middle and southern and those in the Pacific regions, the results are quite striking, as is shown in the subjoined tabular view.* According to this summary the proportion of cases of diarrhœa and dysentery in the middle and southern divisions was nearly forty-five per cent. greater than in the northern; the proportion of deaths more than three times greater; differences which, although not so considerable as those reported by Forry, are yet in the same direction. If dysentery alone be regarded, it will be observed that the proportion of cases was more than twice greater in the middle and southern divisions than in the northern; the proportion of deaths more than three times greater. So that the experience of the United States Army during many years of peace as to the frequency and mortality of these diseases in different parts of the country agrees with the experience of the army during the civil war.

But a study of the mortality tables in the census reports of the United States for 1850, 1860 and 1870 shows how unsafe it would be to assume that this military experience represents correctly the distribution of dysentery among the civil population of the United States. The incomplete character of the census returns, and the probability of numerous errors in the reported causes of death, are willingly conceded to those who may object to the conclusions suggested by these reports; but it must be admitted that the testimony of the census reports is far more valuable than the mere opinion of individuals, and more likely to give a correct view of the causes of death among the civil population than the most accurate statistics of little garrisons of strangers stationed at isolated points.

The volume of vital statistics of the census report of 1870† contains two maps which strikingly illustrate the diversity in the geographical distribution of the malarial fevers

* Average annual prevalence and mortality of *Diarrhœa* and *Dysentery* in the United States Army, 1839–59 inclusive, expressed in ratio per 1,000 of mean strength.

| | Diarrhœa. | | Dysentery. | | Diarrhœa and Dysentery. | |
|---|---|---|---|---|---|---|
| | Cases. | Deaths. | Cases. | Deaths. | Cases. | Deaths. |
| Northern Division | 321 | 1.21 | 67 | .92 | 388 | 2.13 |
| Middle and Southern Divisions | 416 | 3.67 | 145 | 2.87 | 561 | 6.54 |
| Pacific Division | 272 | 1.17 | 62 | 1.42 | 334 | 2.58 |

† *Ninth Census*, Vol. II, Washington, Government Printing Office, 1872. The maps referred to are reproduced, much more beautifully printed and on a larger scale, by F. A. Walker—*Statistical Atlas of the United States*, Washington, 1874, Plates XLII and XLV. In the following remarks I quote also from the volume of the Eighth Census, which contains the mortality statistics—Washington, Government Printing Office, 1866—and from a similar volume of the Seventh Census. The last was published separately as an executive document of the House of Representatives, viz: *Mortality Statistics of the Seventh Census of the United States*, 1850, 33d Congress, 2d Session. House of Reps. Ex. Doc., No. 98, Washington, 1855.

and the fluxes. The first represents the distribution of the deaths from intermittent and remittent fevers. The greater fatality of these diseases in the southern states, and especially along the southern Atlantic and Gulf coasts, and in the valley of the Mississippi and its tributaries, is conspicuously portrayed, and contrasted with the almost complete exemption of the New England states, New York, New Jersey, and the mountainous portions of Pennsylvania, Maryland and Virginia. The second represents the distribution of the deaths from diarrhœa, dysentery and enteritis, grouped under the general head of intestinal diseases. It not only shows no general agreement with the distribution of malarial diseases during the same year, but actually indicates in a general way, and particularly in the Central region, a greater mortality in the northern than in the southern districts. The most striking feature of this map, however, is the presence in it of a number of small patches of very dark shading representing the occurrence during the year of local epidemics. The darkest of these patches represent districts in which the mortality from the diseases in question exceeded 1,400 per 10,000 deaths from all diseases. Such a patch of some size occurs in southern Mississippi, a small one on the borders of Albemarle Sound in North Carolina, and another in the vicinity of Petersburg, Virginia; but the largest patch of the sort was in western Iowa, stretching over into Nebraska and Minnesota, and there is also a small one in northern Michigan. These maps would have been still more useful had they been drawn from the ratios of the diseases to population.

The same volume contains a table* which exhibits by states the proportion of deaths from diarrhœa, dysentery and enteritis per 100,000 living persons. An abstract of this table is subjoined,† and similar ratios, computed from the census returns of 1850 and 1860, are presented in parallel columns, in which the states are arranged in three groups corresponding as closely as possible with the Atlantic, Central and Pacific regions as employed in the tables of this work. This table indicates a very different distribution of the intestinal diseases among the civil population from that suggested by the military experience; but it may be objected that it includes the deaths reported as due to enteritis, a term so loosely used in the United States, as has already been pointed out,‡ that it undoubtedly embraces in these reports, besides a considerable number of deaths really due to dysentery and others due to diarrhœa, an indetermined number resulting from peritonitis. To avoid

* *Op. cit.*, Special tables of mortality, p. xxiii.

† Number of deaths from *Diarrhœa, Dysentery* and *Enteritis* in every 100,000 living persons, according to the Census Reports of 1850, 1860 and 1870:

| Atlantic Region. | 1850. | 1860. | 1870. | Central Region. | 1850. | 1860. | 1870. | Pacific Region. | 1850. | 1860. | 1870. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Maine | 123 | 52 | 43 | Minnesota | 0 | 23 | 63 | Oregon | 68 | 17 | 23 |
| New Hampshire | 204 | 50 | 56 | Wisconsin | 114 | 65 | 80 | California | 108 | 51 | 79 |
| Vermont | 103 | 44 | 60 | Michigan | 110 | 64 | 73 | | | | |
| Massachusetts | 283 | 77 | 76 | Ohio | 161 | 63 | 71 | | | | |
| Rhode Island | 202 | 74 | 53 | Indiana | 164 | 83 | 74 | | | | |
| Connecticut | 277 | 51 | 48 | Illinois | 92 | 104 | 100 | | | | |
| New York | 170 | 70 | 106 | Iowa | 92 | 93 | 68 | | | | |
| New Jersey | 164 | 64 | 61 | Nebraska | .... | 87 | 51 | | | | |
| Pennsylvania | 152 | 56 | 75 | Kansas | ..... | 104 | 88 | | | | |
| Delaware | 107 | 96 | 54 | West Virginia | ..... | ..... | 53 | | | | |
| Maryland | 146 | 76 | 53 | Kentucky | 126 | 57 | 65 | | | | |
| District of Columbia | 166 | 115 | 104 | Missouri | 83 | 123 | 132 | | | | |
| Virginia | 72 | 87 | 84 | Tennessee | 54 | 66 | 60 | | | | |
| North Carolina | 38 | 107 | 68 | Arkansas | 68 | 92 | 63 | | | | |
| South Carolina | 42 | 92 | 76 | Alabama | 88 | 85 | 67 | | | | |
| Georgia | 47 | 87 | 85 | Mississippi | 96 | 87 | 80 | | | | |
| Florida | 78 | 105 | 83 | Louisiana | 121 | 154 | 157 | | | | |
| | | | | Texas | 47 | 119 | 77 | | | | |

‡ See p. 266, *supra*.

this objection, the ratios for diarrhœa and dysentery separately have been computed from the three census reports and are subjoined.*

It will be seen from these ratios that neither diarrhœa nor dysentery was most prevalent in those states in which this would be anticipated on the malarial theory. If we regard the figures for dysentery alone, it will be observed that of the Atlantic states the greatest percentage of cases for 1850 occurred in Connecticut and Massachusetts, for 1860 in Massachusetts and Virginia, for 1870 in Vermont and Massachusetts. Of the states in the Central region, during 1850 the rate of mortality in Ohio and Indiana far exceeded that in any of the Gulf states. During 1860 and 1870, it is true, the rate of mortality in Louisiana was greater than that of any other state in the Central region, but Texas, which came next in 1860, was one of the states of least mortality in 1870. In both years, Wisconsin had a greater mortality than Tennessee, and Iowa than Mississippi. Arkansas, which bears such an evil reputation in the work of Hirsch, on the strength of the military experience of Wright,† had a comparatively moderate mortality in 1850 and 1860, while in 1870 its ratio was smaller than that of any other state in the Central region with the exception of Tennessee.

These considerations appear to show conclusively that dysentery prevails annually among the civil population in all parts of the United States, and that it is not most prevalent in the most malarial regions. It occurs both in the form of sporadic cases and of little local epidemics which fasten upon different districts in different years. At irregular periods these local epidemics assume larger proportions and become more numerous, and such epidemic periods are prone to extend over several successive years together. In such epidemic years, as Hirsch‡ has correctly pointed out, the epidemic prevalence of the disorder is in nowise limited by degrees of latitude or by the malarial character of the region affected; but this circumstance, instead of contradicting the experience of the civil population in ordinary years, fully agrees with it.

* Number of deaths from *Diarrhœa* and *Dysentery* in every 100,000 living persons, according to the Census Reports of 1850, 1860 and 1870:

| Atlantic Region. | 1850. | | 1860. | | 1870. | | Central Region. | 1850. | | 1860. | | 1870. | | Pacific Region. | 1850. | | 1860. | | 1870. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diarrhœa. | Dysentery. | Diarrhœa. | Dysentery. | Diarrhœa. | Dysentery. | | Diarrhœa. | Dysentery. | Diarrhœa. | Dysentery. | Diarrhœa. | Dysentery. | | Diarrhœa. | Dysentery. | Diarrhœa. | Dysentery. | Diarrhœa. | Dysentery. |
| Maine | 27 | 87 | 16 | 22 | 16 | 8 | Minnesota | *0 | *0 | 6 | 10 | 26 | 19 | Oregon | 23 | 30 | 2 | 6 | 7 | 7 |
| New Hampshire | 15 | 182 | 8 | 26 | 15 | 22 | Wisconsin | 55 | 43 | 17 | 31 | 28 | 25 | California | 108 | 58 | 10 | 18 | 24 | 16 |
| Vermont | 1 | 96 | 5 | 15 | 11 | 31 | Michigan | 29 | 70 | 14 | 31 | 31 | 22 | | | | | | | |
| Massachusetts | 24 | 245 | 12 | 46 | 28 | 29 | Ohio | 19 | 129 | 20 | 23 | 30 | 17 | | | | | | | |
| Rhode Island | 30 | 166 | 23 | 34 | 12 | 27 | Indiana | 24 | 129 | 21 | 43 | 40 | 11 | | | | | | | |
| Connecticut | 8 | 260 | 4 | 27 | 13 | 22 | Illinois | 34 | 53 | 35 | 49 | 51 | 25 | | | | | | | |
| New York | 35 | 119 | 20 | 27 | 51 | 24 | Iowa | 57 | 35 | 33 | 39 | 28 | 19 | | | | | | | |
| New Jersey | 23 | 121 | 18 | 21 | 16 | 20 | Nebraska | † | † | 17 | 42 | 21 | 10 | | | | | | | |
| Pennsylvania | 25 | 116 | 14 | 25 | 27 | 19 | Kansas | † | † | 38 | 40 | 47 | 16 | | | | | | | |
| Delaware | 25 | 74 | 25 | 42 | 25 | 16 | West Virginia | † | † | † | † | 29 | 12 | | | | | | | |
| Maryland | 27 | 104 | 26 | 35 | 20 | 21 | Kentucky | 21 | 91 | 16 | 20 | 27 | 16 | | | | | | | |
| Dist. of Columbia | 56 | 103 | 60 | 27 | 61 | 24 | Missouri | 34 | 35 | 60 | 37 | 76 | 29 | | | | | | | |
| Virginia | 23 | 38 | 23 | 46 | 40 | 24 | Tennessee | 27 | 17 | 19 | 27 | 35 | 6 | | | | | | | |
| North Carolina | 17 | 12 | 47 | 43 | 39 | 13 | Arkansas | 22 | 28 | 21 | 41 | 36 | 8 | | | | | | | |
| South Carolina | 19 | 13 | 37 | 39 | 39 | 21 | Alabama | 39 | 35 | 34 | 32 | 34 | 20 | | | | | | | |
| Georgia | 21 | 14 | 35 | 37 | 38 | 28 | Mississippi | 40 | 36 | 33 | 34 | 39 | 12 | | | | | | | |
| Florida | 35 | 21 | 51 | 33 | 34 | 21 | Louisiana | 57 | 44 | 66 | 61 | 70 | 46 | | | | | | | |
| | | | | | | | Texas | 23 | 10 | 34 | 55 | 41 | 11 | | | | | | | |

* No deaths reported. † State not organized.

† See note to p. 416, *supra*. ‡ *Op. cit.*, S. 209.

In the absence of a complete registration of the causes of death throughout the United States it is impossible to express numerically the facts with regard to the epidemic prevalence of dysentery, but some interesting information on the subject can be gathered from American medical literature. According to the testimony of Webster,* three periods of the epidemic prevalence of dysentery occurred during the last century: The first from 1749 to 1753; the second from 1773 to 1777; the third from 1793 to 1798.† During all three periods the violence of the disease was chiefly manifested in the New England States, though in the last two, at least, other parts of the country did not escape. The second period embraces a part of the Revolutionary War; and in the fall of 1776 dysentery was particularly prevalent and fatal among the American troops, but it was also widespread among the civil population.

During the present century, prior to the outbreak of the civil war, we have reports of numerous local epidemics in all parts of the country, but I have only been able to satisfy myself positively of the existence of one period of the widespread epidemic prevalence of the disease, viz: that which extended from 1847 to 1856. Prior to 1846 I find reports of local epidemics from various parts of Massachusetts in 1802 and 1803;‡ Chester county, Pennsylvania, in 1815;§ Fauquier county, Virginia, in 1816;‖ Charlestown, Cambridge and Boston, Massachusetts, in 1817;¶ Sandusky, Ohio, in 1818;** Washington county, New York, in 1820;†† the vicinity of Harrisburg, Pennsylvania, and Cape Ann, Massachusetts, in 1822;‡‡ Beverly, Massachusetts, in 1824;§§ Cecil and Hartford counties, Maryland, in 1825;‖‖ Chester county, Pennsylvania, in 1826;¶¶ the vicinity of the Dismal Swamp, North Carolina, in 1827;*** the town of Cortlandt, New York, in 1828;††† Greene county Alabama, in 1829;‡‡‡ Hollidaysburg, Pennsylvania, in 1832;§§§ the

* NOAH WEBSTER—*Brief History of Epidemic and Pestilential Diseases*, Hartford, 1799.

† *Op. cit.*, Vol. I: "Between 1749 and 1753" dysentery "was as mortal and as general as, between 1773 and 1777," p. 264. With regard to the first period he specifies in 1749 many towns in Connecticut, p. 241; in 1750, Hartford, New Haven and other parts of Connecticut, p. 242; in 1752, the northern parts of America, p. 243. In the second period he specifies, in 1773, New Haven, Conn., and Salem, Mass., p. 260; in 1775, many places in the northern parts of America, p. 261; in 1776, all parts of the country, p. 263. In the third period he specifies, in 1793, Coventry, Conn., and Georgetown on the Potomac River, p. 300; in 1795, New Haven, Conn., p. 308; in 1796, Sheffield, Mass., and Wilmington, N. C., pp. 316 and 317; in 1797, Baltimore, Md., Westport, R. I., and Portland, Me., pp. 308, 327 and 332; and in 1798, Portsmouth, N. H., p. 346. Local epidemics during the periods in question are described or alluded to in the following papers: S. W. WILLIAMS—*Obs. on dysentery*, &c., Amer. Jour. of the Med. Sciences, Vol. III, 1842, p. 127—mentions the epidemic occurrence of dysentery at Deerfield, Mass., in 1751 and 1777; F. B. SAYRE—*Obs. on dysentery*, Philadelphia Med. Museum, Vol. I, 1804-5, p. 391—mentions its prevalence at Bordentown, N. J., in 1792; OLIVER FISKE—*Certain epidemic diseases in the county of Worcester, Mass.*, Med. Communications, of the Mass. Med. Society, Vol. II, 1813, p. 318—mentions its epidemic prevalence in that county in 1796; WM. BUEL—*The bilious fever and dysentery which prevailed in Sheffield, Mass., in the year* 1796, The Med. Repository, Vol. I, 1798, p. 453; J. BARKER—*On the febrifuge virtues of lime, magnesia and alkaline salts in dysentery, &c.*, The Med. Repository, Vol. II, 1799, p. 147—mentions the epidemic prevalence of dysentery in 1797 at Portland, Me., and several neighboring towns; WM. HARRIS—*Facts relative to the black vomit, dysentery, &c., as they occurred in Mifflin county, Pennsylvania, during the hot weather of* 1797, 98 *and* 99, The Med. Repository, Vol. IV, 1801, p. 105. It appears from this paper that dysentery was prevalent in Mifflin county a year after the epidemic period indicated in the text.

‡ S. W. WILLIAMS—*Obs. on dysentery, &c.*, Amer. Jour. of the Med. Sciences, Vol. III, 1842, p. 127.

§ WM. DARLINGTON—Trans. of Med. Soc. of Pa., Session of 1852, p. 70. HIRSCH—*op. cit.*, Bd. II, S. 215—speaks of an epidemic in Massachusetts in 1815, and refers to the *Medical Report* in the New England Jour. of Med. and Surg., Vol. IV, 1815, p. 401, as authority; but this report refers only to the city of Boston, and the statistics of SHATTUCK, cited below, show that the number of deaths from dysentery in Boston in 1815 was only 12.

‖ J. E. COOKE—*Essay on Autumnal diseases*, Transylvania Jour. of Med., Vol. I, 1828, p. 404.

¶ *Prevalent Diseases*, in the New England Jour. of Med. and Surg., Vol. VI, 1817, p. 401; also M. WYMAN—*An account of the dysentery, as it prevailed in Cambridge, Mass., in the years* 1847 *and* 1848, Trans. of Amer. Med. Association, Vol. II, 1849, p. 197.

** C. COLE—*Dysentery, &c., among the inhabitants of Sandusky, Ohio, Autumn of* 1818, The Med. Repository, Vol. V, 1820, p. 134.

†† A. H. COGSWELL—*Dysentery in Hebron, Washington County,* [N. Y.,] *in the Summer and Autumn of* 1820, The Med. Repository, Vol. VII, 1822, p. 122.

‡‡ WM. M. FAHNESTOCK—*On myrtle wax in dysentery*, Amer. Jour. of the Med. Sciences, Vol. II, 1828, p. 313; S. AGNEW—*Epidemic bilious fever at Harrisburg, &c.*, Amer. Med. Recorder, Vol. VI, 1823, p. 139; and J. REYNOLDS in Trans. Amer. Med. Association, Vol. III, 1850, p. 137.

§§ A. HOWE—*Epidemic dysentery as it appeared in Beverly in the Summer and Autumn of* 1824, New England Jour. of Med. and Surg., Vol. XIV, 1825, p. 254.

‖‖ A. C. DRAPER—*Epidemic dysentery in the Counties of Cecil and Hartford, Maryland, in the Summer of* 1825, The Med. Recorder, Vol. XII, 1827, p. 307.

¶¶ WM. DARLINGTON in Trans. of the Med. Soc. of Pennsylvania, Session of 1852, p. 70.

*** THOMAS C. HINES—*Epidemic typhoid dysentery.* The Stethoscope, (Richmond,) Vol. V, 1855, p. 7.

††† B. BASSETT—*Epidemic dysentery and remitting fever, etc.*, The New York Med. Jour., Vol. II, 1831, p. 16.

‡‡‡ T. D. BELL—*Epidemic dysentery in certain parts of Alabama in the summer of* 1829, Transylvania Jour. of Med., Vol. II, 1829, p. 532.

§§§ A. RODRIGUE—Trans. of Med. Soc. of Pennsylvania, Session of 1852, p. 60.

vicinity of Cincinnati, Ohio, in 1834;* Philadelphia in 1837;† South Alabama, and the valley of the Tombigby river, Mississippi, in 1839;‡ Deerfield and Greenfield, Massachusetts, in 1841;§ Cambria and Lancaster counties, Pennsylvania, and Harris, Talbot and Muscogee counties, Georgia, in 1842;‖ Harris and Troup counties, Georgia, in 1843;¶ Lancaster county, Pennsylvania, in 1844;** Northern Indiana in 1845;†† and the vicinity of Jackson, Tennessee, in 1846.‡‡ The mortuary statistics of Shattuck for Boston, those of Dunnel for New York, and a statement of the annual number of deaths from dysentery in Philadelphia, by Dr. William H. Ford,§§ each indicates the occurrence during this time of periods of increased mortality, some of them lasting several years, but do not suggest the idea of any epidemic influence simultaneously affecting all three cities.

* G. BAILEY—*Dysentery, &c., of the Valley of Mill creek, north of Cincinnati, in the spring and summer of* 1834, Western Jour. of Med. and Phys. Sciences, Vol. VIII, 1835, p. 194.

† GERHARD—*Lecture on dysentery*, Med. Examiner, Vol. II, 1839, p. 751.

‡ H. V. WOOTEN—*Epidemic dysentery of South Alabama*, Med. Examiner, Vol. II, 1839, p. 437; J. P. MOORE—*Report on the epidemics and climatology of Mississippi*. Trans. of the Amer. Med. Association, Vol. XXII, 1871, p. 208.

§ S. W. WILLIAMS—*Obs. on dysentery, &c.*, Amer. Jour. of the Med. Sciences, Vol. III, 1842, p. 127.

‖ A. RODRIGUE—*loc. cit.*; D. H. AGNEW—*Epidemic dysentery of Lancaster County*, Med. Examiner, Vol. VIII, 1852, p. 205; and J. J. M. GOSS—*Epidemic dysentery*, Southern Med. and Surg. Jour., Vol. X, 1854, p. 459.

¶ GOSS—*loc. cit.*

** AGNEW—*loc. cit.*

†† H. P. AYRES—*Dysentery*, North Amer. Med. Chir. Review, Vol. IV, 1860, p. 849.

‡‡ J. E. STEWART—*Epidemic dysentery*, Missouri Med. and Surg. Jour., Vol. III, 1847, p. 145.

§§ L. SHATTUCK—*On the vital Statistics of Boston*, Amer. Jour. of the Med. Sciences, Vol. I, 1841, p. 396. He tabulates the number of deaths from dysentery as follows:

| Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|---|---|
| 1811 | 29 | 1818 | 4 | 1825 | 60 | 1832 | 24 |
| 1812 | 2 | 1819 | 13 | 1826 | 48 | 1833 | 41 |
| 1813 | 5 | 1820 | 17 | 1827 | 27 | 1834 | 48 |
| 1814 | 4 | 1821 | 73 | 1828 | 31 | 1835 | 45 |
| 1815 | 12 | 1822 | 40 | 1829 | 21 | 1836 | 38 |
| 1816 | 6 | 1823 | 37 | 1830 | 23 | 1837 | 45 |
| 1817 | 23 | 1824 | 69 | 1831 | 29 | 1838 | 65 |

H. G. DUNNEL—*Interments in the city and county of New York*, Amer. Jour. of the Med. Sciences, Vol. XXII, 1838, p. 244. Number of deaths from dysentery annually:

| Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|---|---|
| 1805 | 60 | 1813 | 145 | 1821 | 142 | 1829 | 126 |
| 1806 | 52 | 1814 | 72 | 1822 | 109 | 1830 | 128 |
| 1807 | 30 | 1815 | 84 | 1823 | 98 | 1831 | 156 |
| 1808 | 24 | 1816 | 71 | 1824 | 120 | 1832 | 136 |
| 1809 | 17 | 1817 | 71 | 1825 | 138 | 1833 | 87 |
| 1810 | 12 | 1818 | 141 | 1826 | 193 | 1834 | 67 |
| 1811 | 29 | 1819 | 219 | 1827 | 199 | 1835 | 91 |
| 1812 | 37 | 1820 | 243 | 1828 | 155 | 1836 | 116 |

Dr. WM. H. FORD, secretary of the Board of Health of Philadelphia, kindly furnished the following figures in a letter received from him January 13, 1877. Deaths from dysentery in Philadelphia:

| Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|---|---|
| 1807 | 70 | 1816 | 30 | 1825 | 87 | 1833 | 44 |
| 1808 | 40 | 1817 | 33 | 1826 | 72 | 1834 | 70 |
| 1809 | 20 | 1818 | 31 | 1827 | 58 | 1835 | 114 |
| 1810 | 27 | 1819 | 37 | 1828 | 50 | 1836 | 95 |
| 1811 | 48 | 1820 | 127 | 1829 | 53 | 1837 | 119 |
| 1812 | 24 | 1821 | 124 | 1830 | 49 | 1838 | 141 |
| 1813 | 69 | 1822 | 191 | 1831 | 121 | 1839 | 120 |
| 1814 | 66 | 1823 | 187 | 1832 | 78 | 1840 | 118 |
| 1815 | 44 | 1824 | 69 | | | | |

These figures from 1831 to 1840 inclusive, are identical with those published in the last of the three papers by G. EMERSON—*Vital Statistics of Philadelphia*, Amer. Jour. of the Med. Sciences, Vol. I, 1827, p. 116; Vol. IX, 1831, p. 17; and Vol. XVI, 1848, p. 13. In the first two of these papers the statistics of diarrhœa and dysentery are given together.

With regard to the great epidemic period from 1847 to 1856, we possess exceedingly interesting data. The committees on epidemics of the American Medical Association collected much information, and undoubtedly stimulated the preparation of many of the numerous reports which appear in the journals. Moreover, we possess some statistics which, although far from complete, give an excellent notion of the resulting mortality. From these various sources of information I gather that during the period in question the epidemic influence was by no means uniformly distributed, but was manifested in the form of a multiplication of the local epidemics that occur in ordinary years.

These local epidemics were not limited by the northern boundaries of the United States, for we have reports of their occurrence in Canada, especially in 1849.* With regard to the New England states the most satisfactory information is from Massachusetts. The registration reports of that state show that for six years prior to 1847 the deaths from dysentery had averaged 236 annually.† In 1847 the number suddenly increased to 1,074; in 1848 to 2,135; in 1849 it was 2,455. After this it averaged above a thousand deaths a year until 1856, when it fell to 930, and subsequently steadily decreased till 1860, in which year the number of deaths was 441. The population of Massachusetts was 994,514 in 1850, and 1,231,066 in 1860. No such definite information exists with regard to the rest of the New England states, but a committee of the American Medical Association reports the general prevalence of dysentery throughout these states in 1848.‡ We have information of its unusual frequency at Hartford, Connecticut, from 1848 to 1852,§ and the registration reports of the state of Rhode Island show it to have been more frequent than usual in that state during 1853, 1854 and 1855.‖ From the state of New York we have reports referring to or describing local epidemics in 1847, 1848, 1849, 1851, 1853,

* E. STIMSON—*Remarks on the epidemic bowel complaint of* 1849, *commonly called epidemic dysentery*, Buffalo Med. Jour., Dec., 1849, p. 377; and T. MACK—*Epidemic bowel complaint during the latter portion of the summer* 1849 *at St. Catharines, Canada West*, British American Jour. of Med. and Phys. Science, Jan., 1850, p. 225.

† See the registration reports of the State of Massachusetts, from which I have abstracted the number of deaths from dysentery annually as follows:

| Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|---|---|
| 1841 | 268 | 1846 | 410 | 1851 | 1,674 | 1856 | 930 |
| 1842 | 294 | 1847 | 1,074 | 1852 | 1,018 | 1857 | 715 |
| 1843 | 120 | 1848 | 2,135 | 1853 | 1,046 | 1858 | 752 |
| 1844 | 200 | 1849 | 2,455 | 1854 | 1,159 | 1859 | 612 |
| 1845 | 192 | 1850 | 1,188 | 1855 | 1,131 | 1860 | 441 |

In these registration reports from 1841 to 1848 the year commences May 1st, and includes the first four months of the following year. The report for 1848 is for eight months only, from May 1st to Dec. 31st; the subsequent years begin Jan. 1st and end Dec. 31st. See especially the remarks in the 8th registration report, Boston, 1851, p. 114, and the 10th, Boston, 1852, p. 96. See also J. M. NYE—*Epidemic dysentery in Lynn*, [Mass.,] 1848, Boston Med. and Surg. Jour., Vol. XLIII, 1851, p. 212; the report of MORRILL WYMAN—Trans. Amer. Med. Ass., Vol. II, 1849, p. 197, on its prevalence at Cambridge, Mass., during 1847-8; and J. REYNOLDS—*Typhoid fever and dysentery in the epidemic form during the last four seasons on Cape Ann*, Trans. Amer. Med. Ass., Vol. III, 1850, p. 137.

‡ D. F. CONDIE—*Report of Committee on Pract. Medicine*, Trans. Amer. Med. Ass., Vol. II, 1849, p. 152.

§ Proc. of 63d annual convention of the Connecticut Med. Soc., 1855, p. 43. The number of deaths from dysentery in Hartford is given as follows:

| Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|---|---|
| 1847 | 5 | 1849 | 53 | 1851 | 68 | 1853 | 11 |
| 1848 | 13 | 1850 | 19 | 1852 | 46 | 1854 | 10 |

‖ The registration reports of the state of Rhode Island commence in 1853; from that time to 1860 the number of deaths from dysentery is given as follows:

| Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|---|---|
| 1853 | 67 | 1855 | 71 | 1857 | 65 | 1859 | 53 |
| 1854 | 118 | 1856 | 51 | 1858 | 61 | 1860 | 49 |

1854 and 1855.* From the state of New Jersey we have such reports for 1848 and 1851.† In the state of Pennsylvania local epidemics began to prevail during 1847, but they appear to have been most general and severe during the years 1851, 1852 and 1853, to the first of which most of the accounts refer.‡ The mortuary reports of the city of Philadelphia, on the other hand, represent the years 1849, 1851 and 1852 as those of greatest mortality. In Maryland it would appear from the statistics of the city of Baltimore, published by Joynes and Frick, that the epidemic prevalence of the disease began in 1849 and reached its height in 1854. It prevailed to the same extent in 1855, and then slowly declined, but was still unusually prevalent in 1857, and can hardly be said to have returned to its usual figure before 1860.§ The reports from Virginia show that dysentery was epidemic

* CONDIE—*loc. cit.*—reports dysentery as epidemic in New York in 1848. I find also the following special reports: DE WITT C. VAN SLYCK—*Endemic dysentery at Lyons, New York, during the summer and autumn of* 1847, New York Jour. of Med., Vol. X, 1848, p. 204; A. WILLARD—*Dysentery in the village of Greene, Chenango county, New York, during the past summer*, The Annalist, Vol. III, 1849, p. 151; S. B. HUNT—*Mercurials in dysentery*, Buffalo Med. Jour., Vol. VIII, 1852-3, pp. 232 and 327—mentions an epidemic in Livingston county in 1848; T. G. MEACHEM—*Dysentery as it prevailed in East Bloomfield, New York, during the autumn of* 1848, Buffalo Med. Jour., Vol. IV, 1848, p. 395; A. WILLARD—*Epidemic dysentery*, New York Jour. of Med., Vol. IV, 1850, p. 77, in Greene, New York, 1849; E. R. MAXSON—*Malignant dysentery*, Buffalo Med. Jour., Vol. VIII, 1852-3, p. 354; H. TAYLOR and J. H. BEECH—*Report on dysentery*, Trans. Amer. Med. Ass., Vol. VIII, 1855, p. 545—speak of dysentery as epidemic at Lima and in Wyoming county, New York, in 1853; M. C. HASBROUCK—*Remarks on dysentery*, New York Jour. of Med., Vol. XI, 1853, p. 49—speaks of dysentery as often epidemic in Rockland county, New York, but without giving dates; F. D. LENTE—*Epidemic dysentery in the village of Cold Spring during the years* 1854-5, New York Jour. of Med., Vol. XVI, 1856, p. 171.

† J. F. GARRISON, in Trans. Amer. Med. Ass., Vol. II, 1849, p. 191; and J. PARRISH—*op. cit.*, Vol. V, 1852, p. 295.

‡ JAMES BRYAN—*Epidemic dysentery*, New York Jour. of Med., Vol. X, 1848, p. 49—speaks of the disease as epidemic in Philadelphia in 1847; and A. P. DUTCHER—*Epidemic dysentery*, Cincinnati Med. Observer, Vol. II, 1857, p. 535—describes it as prevailing in the vicinity of Enon Valley, Pennsylvania, during the same year. The extent to which it prevailed throughout the state in 1851 is well indicated in the several county reports in the Transactions of the Med. Society of Pennsylvania, Session of 1852. It was also epidemic in Philadelphia during the same year. See HOLLINGSWORTH—*Epidemic dysentery among the orphans at Girard College*, Trans. of the College of Physicians, Vol. I, 1853, p. 166; and the remarks of Dr. CONDIE on its general prevalence throughout the city at the time. See also the account given of epidemics in various parts of the state during 1851 in the report on Pennsylvania, Trans. Amer. Med. Ass., Vol. V, 1852, pp. 305-339. Note also B. F. LINDLY—*An epidemic disease of Washington County, Pennsylvania, during the summer and autumn of* 1851, The Western Lancet, Vol. XIII, 1852, p. 82. According to DUTCHER—*loc. cit.*—it was again epidemic in Enon Valley in 1852. For accounts of other local epidemics during that year and 1853, see the Transactions of the Medical Society of Pennsylvania, Sessions of 1853 and 1854. In the volume for the session of 1856, p. 96, note particularly the account given by D. LEASURE of the epidemic in Lawrence county in 1851, in which the author shows clearly that the distribution of the disease in the county did not coincide with that of intermittent fever. Dr. WM. H. FORD, secretary of the Philadelphia Board of Health, has kindly furnished the following statement with regard to that city. Annual number of deaths from dysentery in Philadelphia from 1840 to 1860, inclusive:

| Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|---|---|
| 1840 | 118 | 1846 | 69 | 1852 | 552 | 1858 | 240 |
| 1841 | 130 | 1847 | 171 | 1853 | 370 | 1859 | 129 |
| 1842 | 100 | 1848 | 315 | 1854 | 447 | 1860 | 178 |
| 1843 | 93 | 1849 | 578 | 1855 | 266 | | |
| 1844 | 57 | 1850 | 412 | 1856 | 301 | | |
| 1845 | 65 | 1851 | 501 | 1857 | 197 | | |

§ L. S. JOYNES—*Statistics of the mortality of Baltimore from* 1836 *to* 1849, Amer. Jour. of the Med. Sciences, Vol. XX, 1850, p. 297; and CHARLES FRICK—*Vital statistics of the city of Baltimore*, op. cit., Vol. XXX, 1855, p. 312; also by the same—*Pathology of epidemic dysentery*, op. cit., Vol. XXII, 1851, p. 305. According to these authorities the annual number of deaths from dysentery in Baltimore was as follows:

| Year. | No of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|---|---|
| 1836 | 25 | 1841 | 22 | 1846 | 7 | 1851 | 161 |
| 1837 | 39 | 1842 | 25 | 1847 | 42 | 1852 | 222 |
| 1838 | 25 | 1843 | 22 | 1848 | 46 | 1853 | 242 |
| 1839 | 16 | 1844 | 13 | 1849 | 148 | 1854 | 252 |
| 1840 | 27 | 1845 | 13 | 1850 | 237 | | |

These papers refer only to the city of Baltimore. We also hear of it in 1851 in Kent county: See Report on *Epidemic diseases of Maryland*, Trans. of the Amer. Med. Ass., Vol. V, 1852, pp. 341-351. J. W. MOHLER, secretary of the Health Department of Baltimore, has furnished me the number of deaths from dysentery in that city since the report of FRICK, from which I abstract the following:

| Year. | No. of Deaths. | Year. | No. of Deaths. | Year. | No. of Deaths. |
|---|---|---|---|---|---|
| 1855 | 252 | 1857 | 202 | 1859 | 141 |
| 1856 | 213 | 1858 | 137 | 1860 | 59 |

I may add, on the authority of the same gentleman, that from 1866 to 1876, inclusive, in spite of the increased population, the largest number of deaths from dysentery for any one year was 85 during 1869, the smallest 52 for 1876.

in Henry county during the summer of 1853, and throughout the part of the state which now constitutes West Virginia, in 1851, 1852 and 1853.* The only report I find from North Carolina refers to 1851 and 1852.† The reports from South Carolina refer to the years 1851, 1852, 1853, 1854 and 1855;‡ those from Georgia to 1847, 1848, 1851, 1852, 1853 and 1854.§ So far as these reports give numerical statements with regard to the prevalence of the disease in any particular cities or districts, they are in accord with the Census of 1850, which shows a greater mortality from dysentery in the northern than in the southern portion of the Atlantic region.

Still more numerous are the accounts of the epidemic prevalence of dysentery during the period under consideration in various parts of the great Central region of the continent. The earliest report from Ohio is for 1847, the latest for 1853; the reports referring to 1851 are more numerous than those for any other of these years.‖ The same is true of Indiana, the reports from which extend from 1848 to 1853.¶ The few reports from Illinois refer to 1853, 1854 and 1855.** From Michigan the reports are fuller and represent the epidemic prevalence of the disease in various parts of the state from 1847 to 1855.†† They are still more complete from Kentucky and Tennessee; in the case of the former

* P. R. REAMEY—*The epidemic dysentery of Henry county, Virginia, as it prevailed during the summer of* 1853, The Stethoscope, Vol. III, 1853, p. 557. J. E. REEVES—*The Health and Wealth of the city of Wheeling*, Baltimore, 1871, p. 150.

† THOMAS HINES—*Epidemic typhoid dysentery*, The Stethoscope, Vol. V, 1855, p. 7. The district referred to borders on the Dismal Swamp.

‡ W. T. WRAGG—*Epidemic dysentery on Ashepoo river in* 1851, *afterwards spreading to Combahee river*, Charleston Med. Jour. and Rev., Vol. VI, 1851, p. 757. SALLEY—Trans. of South Carolina Med. Ass., same Jour., Vol. XI, 1856, p. 184—states that dysentery was epidemic at Orangeburg during the summers of 1852-3-4-5. See also MOBLEY—*Epidemic dysentery as it appeared in the districts of Chester and Lancaster in* 1853-4. Proc. of the South Carolina Med. Ass., 1855, Appendix F, p. 62.

§ SMITH and MARTIN—*Notice of an epidemic dysentery*, Southern Med. and Surg. Jour., Vol. IV, 1848, p. 30. This account refers to the vicinity of Atlanta, Georgia, in 1847. J. J. M. GOSS—*Epidemic dysentery*, same Jour., Vol. X, 1854, p. 459—states that the disease was epidemic in 1847-8 in Oglethorpe and Madison counties; in 1852 in Walton and Gwinnett counties. J. S. WEATHERBY—*Dysentery in Gordon and Cass counties*, [Georgia, 1851,] same Jour., Vol. VII, 1851, p. 725. H. F. CAMPBELL—*Cases of an unusual form of fever and dysentery*, [Georgia, 1851,] same Vol., p. 567. According to the *Reports on epidemics*, Trans. Amer. Med. Ass., Vol. V, 1852, p. 367, it was also epidemic in Houston and Hancock counties, Georgia, during 1851. E. M. PENDLETON—*Epidemic dysentery in Hancock county, Georgia, during the years* 1851-2-3, Charleston Med. Jour. and Review, Vol. IX, 1854, p. 168. D. C. O KEEFFE—*Epidemic dysentery*, [vicinity of Greensboro', Georgia, 1852-53,] Southern Med. and Surg. Jour., Vol. X, 1854, p. 325. H. A. RAMSAY—*Bloody Flux*, [vicinity of Thompson, Georgia, 1853,] Nashville Jour. of Med. and Surg., Vol. V, 1853, p. 257. B. R. RIVES—*Cases of dysentery*, Southern Med. and Surg. Jour., Vol. XV, 1854, p. 650—speaks of dysentery as epidemic in Baker county, Georgia, in 1853-4.

‖ I. A. COONS—*Dysentery in Montgomery county, Ohio*, Western Lancet, Vol. XV, 1854, p. 195—states that the disease prevailed annually for six years, 1847-52, inclusive, but especially in 1849 and 1852. L. SLUSSER—*Nitrate of silver in epidemic dysentery*, Medical Examiner, Vol. VI, 1850, p. 450, vicinity of Canal Fulton, Ohio, 1849. J. A. MURPHY—*Epidemic dysentery of* 1849-50, Western Lancet, Vol. XII, 1851, p. 69, Cincinnati, Ohio. S. P. HILDRETH—*Epidemic dysentery as it appeared in Marietta, Ohio, in* 1851, same Jour., Vol. XIII, 1852, p. 166. B. STANTON—*Dysentery as it appeared in Salem* [Ohio] *and vicinity during the summer of* 1851, same Vol. p. 509. C. W. PRATHER—*Dysentery complicated with gastritis*, same Vol., p. 227—states that the disease was epidemic in Butler county during the summers of 1849-50-51. J. W. TULLIS—*Treatment of dysentery*, Ohio Med. and Surg. Jour., Vol. III, 1851, p. 323, epidemic at Troy, Ohio, 1850. T. W. GORDON—*Remarks on dysentery*, same Jour., Vol. V, 1853, p. 208, vicinity of Georgetown, Ohio, 1851. D. A. HOFFMAN—*Opium in a case of epidemic dysentery*, same Jour., Vol. IV, 1852, p. 383—states that it was epidemic in the vicinity of Jackson C. H., Ohio, 1851. S. C. MENDENHALL—*Rheumatic inflammation as a sequel of dysentery*, same Vol., p. 376—states that it was epidemic in many parts of Ohio during 1851. J. B. EVANS—*Epidemic dysentery*, North-Western Med. and Surg. Jour., Vol. IX, 1852-3, p. 493, Ross county, Ohio, 1852. S. C. ROBERTS—*Dysentery as it appeared at Bainbridge, Ohio, and vicinity during the summer and autumn of* 1852, Western Lancet, Vol. XIV, 1853, p. 597. S. C. MENDENHALL—*Note-book gleanings*, Ohio Med. and Surg. Jour., Vol. VI, 1853-4, p. 30—mentions that dysentery was epidemic in the vicinity of Sunbury, Delaware county, Ohio, during the summer and autumn of 1852. For other accounts of epidemic dysentery in Ohio, especially during 1849, 1851, 1852 and 1853, see the reports on the epidemics of Ohio in the Trans. of the Amer. Med. Ass., Vol. V, 1852, pp. 438-485, and Vol. VII, 1854, pp. 288-356.

¶ I. CASSELBERRY—*Epidemic dysentery*, Western Lancet, Vol. VIII, 1848, p. 143, Evansville, Ind., and vicinity, 1848. The same—*Diseases of Southern Indiana*, same Jour., Vol. XIII, 1852, p. 781—says dysentery was epidemic in this region during the summers of 1848-49-50-51. WM. MATHEWS—*Epidemic dysentery of the West*, Nelson's Northern Lancet, Vol. IV, 1851-2, p. 127—says dysentery was epidemic in Western Indiana in 1851. W. DICKEY—*Dysentery as it prevailed in the town and vicinity of Dalton, Wayne county, Ind., in the summer and autumn of* 1851, Western Lancet, Vol. XIII, 1852, p. 526. J. S. DU HATE—*Muco-gastro-enteritis, as it prevailed in Southern Indiana as an epidemic*, [1851,] same Jour., Vol. XII, 1851, p. 719. E. READ—*Dysentery and its treatment*, Indiana Med. Jour., Vol. I, 1854, p. 29—states that dysentery was epidemic in the region about Terre Haute, Ind., during 1852-3. For further accounts of the prevalence of dysentery in Indiana during 1849 and 1851, see W. T. S. CORNEIT—*Report of committee on Practice of Med.*, Proceedings of 3d annual meeting of the Indiana State Med. Society, May, 1852, p. 33; and for its prevalence during 1851-3 see the reports of the committees on the epidemics of Indiana, Trans. of the Amer. Med. Ass., Vol. V, 1852, pp. 485-503, and Vol. VII, 1854, pp. 356-390.

** W. S. LINN—*A word on dysentery*, Iowa Med. Jour., Vol. I, 1854, p. 161—mentions its prevalence at Chili, Illinois, in 1853. S. W. THOMPSON—*Ileo-colitis as it prevailed in and around Fairfield, Wayne county, Ills., during the summer of* 1854, North-Western Med. and Surg. Jour., Vol. III, 1854, p. 529. H. W. DAVIS—*Dysenteria intermittens*, same Jour., Vol. V, 1856, p. 295—states that dysentery was epidemic in the eastern portion of Illinois during the summer and autumn of 1855.

†† H. TAYLOR and J. H. BEECH—*Report on dysentery*, Trans. of the Amer. Med. Ass., Vol. VIII, 1855, p. 547—mention its prevalence in various parts of Michigan in 1847-48-49-50-51 and 1854. See also the same Transactions, Vol. V, 1852, pp. 526-528, for further particulars with regard to its prevalence in 1851, and Vol. VII, 1854, pp. 390-418 as to its prevalence in 1852-3; also the following papers: P. K. BAILEY—*Dysentery*, North-Western Med. and Surg. Jour., Vol. I, 1853, p. 385, in which its epidemic occurrence in the vicinity of Almont, Mich., in 1852 is mentioned; J. AVERY—*Epidemic dysentery as it prevailed in the Grand River Valley* [Michigan] *during the autumn of* 1855, The Med. Independent, Vol. I, 1856, p. 332.

state they extend from 1849 to 1853,* in the case of the latter from 1846 to 1856.† The reports from Alabama extend from 1849 to 1856, and are particularly full with regard to 1851.‡ From other states in the Central region the reports are either fragmentary or altogether wanting. There is a report from Mississippi for 1852;§ one from Louisiana for 1854 and 1855;‖ several from Texas for 1853, 1855 and 1856;¶ and one from Arkansas for 1853–4.**

Here, too, I may mention the reports of Stillman and Blake, which have been cited by Hirsch,†† as evidence of the endemic prevalence of dysentery in California, but which refer to years, 1849–50, belonging to the great epidemic period under discussion, a circumstance which may account for the unusual frequency of the disease at the time referred to, if indeed it were not entirely due to the errors of diet and the exposed life of the emigrants who, at the period in question, were swarming into the state in search for gold. Certainly no unusual prevalence of dysentery in California is indicated by the Census Reports of 1860 and 1870, in both of which it has a percentage of mortality less than the average for the states of the Atlantic or Central regions.

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* WM. C. SNEED—*Epidemic dysentery in Frankfort and Franklin county, Kentucky, during the summer and fall of* 1849, Western Jour. of Med. and Surg., Vol. V, 1850, p. 1. J. HARDIN—*Treatment of dysentery.* same Jour., Vol. VIII, 1851, p. 1—states that it was epidemic at Louisville during 1849–50. Its prevalence in that city during 1850 and 1853 is also mentioned by L. P. YANDELL—*Trans. of the College of Phys. and Surgs. of Louisville*, American Practitioner, Vol. II, 1870, pp. 279 and 286. W. W. FRITTS—*On dysentery*, Western Jour. of Med. and Surg., Vol. XII, 1853. p. 1, Nicholas county, Ky., 1851. See also *Report on the epidemics of Tennessee and Kentucky*, Trans. of the Amer. Med. Ass., Vol. V, 1852, p. 557, for some further account of its prevalence in Kentucky during 1851, and two subsequent reports in the same Transactions, Vol. VI, 1853, p. 340, and Vol. VII, 1854, pp. 111 and 114, for its prevalence in 1852 and 1853. The table on p. 111 reports 1,019 deaths from dysentery during 1852 in forty-nine counties of Kentucky.

† J. E. STEWART—*Epidemic dysentery*, Missouri Med. and Surg. Jour., Vol. III, 1847, p. 145—mentions its prevalence at Jackson and Memphis, Tenn., during the summer and fall of 1846 and 1847. J. HARRIS—*Dysentery*, Nashville Jour. of Med. and Surg., Vol. V, 1853, p. 337, at Cagewell, Tenn., 1851–2–3. R. THOMPSON—*Dysentery*, same Jour., Vol. IV, 1853, p. 143, at Salisbury and Lancaster, Tenn., 1852. See also, for further particulars with regard to its prevalence in Tennessee in 1851–2–3, the reports on the epidemics of Tennessee and Kentucky cited in the last note. T. L. MADDIN—*Dysentery*, Nashville Jour. of Med. and Surg., Vol. V, 1853, p. 198—says that during the summer of 1853 dysentery prevailed extensively not only in Tenoessee, but throughout the whole Mississippi Valley, and in many places with alarming fatality. WM. P. MOORE—*Opium in dysentery*, same Vol., p. 204—mentions that in 1853 dysentery was epidemic throughout the valley of Green river, Kentucky, and particularly in Simpson county. ISAAC TAYLOR—*Dysentery*, same Vol., p. 205, East Tenoessee, 1853. J. T. MARABLE—*Dysentery or bloody flux*, same Jour., Vol. VI, 1854, p. 1, Montgomery county, Tenn., 1853. M. RANSOM—*Epidemic dysentery near Salem, Rutherford county, Tenn., during the summer of* 1855, Southern Jour. of the Med. and Phys. Sciences, Vol. IV, 1856, p. 87. R. O. CURREY—*Epidemic dysentery in Knox county* [Tenn.] *in July and August*, 1856, same Jour., Vol. V, 1857, p. 100. I. TAYLOR—*Epidemics of Blount county* [Tenn.] *during* 1856, Nashville Jour. of Med. and Surg., Vol. XII, 1857, p. 502—dysentery was epidemic from July to October. B. FRAZIER—*Epidemic dysentery in the Sequatchee Valley* [Tenn.] *in* 1856, Southern Jour. of the Med. and Phys. Sciences, Vol. V, 1857, p. 231.

‡ W. B. WELCH—*Dysentery in Morgan county, North Alabama*, 1849–50, The Western Lancet, Vol. XIII, 1852, p. 19. A. A. J. RIDDELL—*Epidemic bloody flux*, New Orleans Med. and Surg. Jour., Vol. VII, 1850, p. 99, Prairie Bluff, Ala., 1850. F. E. GORDON—*Salines and opiates in dysentery*, same Jour., Vol. IX, 1852, p. 188—states that dysentery was epidemic throughout Alabama in 1851. WM. TAYLOR—*Epidemic dysentery at Talladega, Ala., in the autumn of* 1851, same Jour., Vol. VIII, 1852, p. 592. For further particulars as to the prevalence of the disease in various parts of Alabama during 1851, see Proc. of the Med. Ass. of the State of Alabama, Session of December, 1851. W. TAYLOR, in the same Transactions for 1855, states that dysentery was also epidemic in Alabama in 1852 and 1853. See also, for further particulars with regard to epidemic dysentery in Alabama in 1851, the *Reports on Epidemics*, Trans. Amer. Med. Ass., Vol. V, 1852, p. 380. F. E. H. STEGER—*Dysentery*, Nashville Med. Record, Vol. II, 1859–60, p. 270—affirms that dysentery was rare in northern Alabama until 1852, after which it recurred annually for several years. J. TURRENTINE—*Epidemic dysentery*, Charleston Med. Jour., Vol. XII, 1857, p. 145—states that dysentery had been present in northern Alabama for several years prior to the date of his paper. According to S. A. CARTWRIGHT—*Dysentery among negroes*, New Orleans Med. and Surg. Jour., Vol. XI, 1854–5, p. 145—local epidemics occurred on certain plantations in south Alabama in 1851–52 and 1854.

§ R. R. GRESHAM—*Dysentery*, &c., Western Jour. of Med. and Surg., Vol. XII, 1853, p. 304—mentions that dysentery was epidemic in the vicinity of Ebenezer, Miss., in 1852.

‖ J. B. PAYNE—*Epidemic dysentery*, New Orleans Med. and Surg. Jour., Vol. XV, 1858, p. 87, Claiborne parish, Louisiana, 1854–5.

¶ J. P. CUNLIFFE—*Malignant epidemic dysentery*, Southern Jour. of Med. and Phys. Sciences, Vol. I, 1853, p. 320, Titus county, Texas, 1853. W. A. RAWLINGS—*Treatment of dysentery*, Nashville Jour. of Med. and Surg., Vol. X, 1856, p. 28, epidemic about Huntsville, Texas, 1855. W. L. GAMMAGE—*Dysentery*, New Orleans Med. and Surg. Jour., Vol. XIII, 1856–7, p. 451, epidemic in Cherokee county, Texas, 1856.

** G. W. LAWRENCE—*Report on Climatology, &c., of Arkansas*, Trans. Amer. Med. Ass., Vol. XXIII, 1872, p. 419—states that during 1853–4 dysentery was epidemic in several counties of Arkansas.

†† J. D. B. STILLMAN—*Obs. on the med. topography and diseases (especially diarrhœa) of the Sacramento Valley, California, during the years* 1849–50, New York Jour. of Med., Vol. VII, 1851, p. 289: "The number who arrived in California during the six months from the first July, 1849, to first of January, 1850, was over 90,000; of these nearly 30,000 performed a voyage by sea of 17,000 miles, more than 60,000 crossed a wilderness of greater extent than the entire distance from the mouth of the Tagus to the eastern confines of Russia, over arid plains and rugged mountains. Of this number, it was roughly estimated that one-fifth had found graves within the first six months after their arrival." Here were all the conditions which usually accompany the dysentery of armies. Scurvy was common, but STILLMAN thinks that the scorbutic subjects were no more disposed to the fatal dysenteries and diarrhœas which prevailed than the others, and affirms, "those who died from scurvy had neither dysentery nor diarrhœa." He insists that the diarrhœa and dysentery of California are endemic and "of malarious origin, in common with intermittent and remittent fevers," p. 307. JAMES BLAKE—*Climate and diseases of California*, Amer. Jour. of the Med. Sci., Vol. XXIV, 1852, p. 53—says that during October and November, 1850, the principal diseases were diarrhœa and dysentery. They were very fatal, and occurred chiefly among emigrants who had just crossed the plains. Compare the remarks of A. HIRSCH—Prager Vierteljahrschrift für die Prakt. Heilk., Bd. XLVII, 1855, S. 68, paper cited *supra* in note to p. 401.

The mortality report of the Census of 1850 gives valuable information with regard to the actual severity of the great dysenteric epidemic which has just been sketched. So many of the reports cited refer to 1851 that it seems probable that this year, rather than 1850, was that during which the disease was at its height; nevertheless the number of deaths from dysentery reported in 1850 was 20,556, while, in spite of the constantly increasing population of the country, the total number reported in 1860 was but 10,468, and in 1870 only 7,912. I append in a foot-note* a table which gives a summary view of the total number of deaths from diarrhœa, dysentery and enteritis in the whole United States, according to each of the three census reports, together with ratios expressing the mortality per 100,000 living persons. These ratios indicate that the percentage of mortality from dysentery during the year represented by the Census Report of 1850 was more than four times as great as in 1870; and it is in every way probable that during 1851 the mortality was still greater than this. It has already been shown† that according to the Report of 1850 the mortality from dysentery was greater in the northern and central than in the southern states of the Central region; and the remark already made with regard to the Atlantic region, that nothing in the special reports I have collected is in disaccord with this testimony, may be repeated here. So that the interesting evidence that has been presented with regard to the epidemic period under discussion affords no substantial support to the malarial theory of the causation of dysentery.

In concluding this branch of the subject it may be added, that from 1856 to 1861 I find but few reports of local epidemics of dysentery, viz: one from Fort Gaines, Georgia, in 1857; one from Le-Roy, Illinois, in 1858; and one from North Carolina, in which the disease is affirmed to occur more or less extensively in that state every summer,‡ and to prevail at times in the mountainous districts in which the periodic fevers do not originate.

INFLUENCE OF SEASON ON THE PREVALENCE OF DYSENTERY IN THE UNITED STATES.—The comparative monthly frequency of acute dysentery in each of the three regions during the war, and the year subsequent to it, is represented in the following tables for white and colored troops separately. Curves constructed from the ratios given in these tables would closely approximate in their form the curves presented in Section I, which represent the total number of cases of diarrhœa and dysentery, both acute and chronic. It appears from these ratios that acute dysentery was most frequent during the summer and autumn, but certain irregularities in the curves in individual years and regions plainly indicate that other influences, connected undoubtedly with the movements and exposures of the great armies, may materially modify the effect of season alone.

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| * | 1850. | | 1860. | | 1870. | |
|---|---|---|---|---|---|---|
| | Total No. of deaths in United States. | Ratio per 100,000 living persons. | Total No. of deaths in United States. | Ratio per 100,000 living persons. | Total No. of deaths in United States. | Ratio per 100,000 living persons. |
| Dysentery | 20,556 | 89 | 10,468 | 33 | 7,912 | 21 |
| Diarrhœa | 6,366 | 27 | 7,850 | 25 | 14,195 | 37 |
| Enteritis | 2,886 | 12 | 6,304 | 20 | 9,046 | 23 |

† See the table in note * p. 420, *supra*.

‡ WM. J. JOHNSON—*Epidemic dysentery as it occurred at Fort Gaines, Clay county, Georgia, during the summer of* 1857, North Amer. Med. Chir. Review, Vol. II, 1858, p. 293. J. W. COLEMAN—*An epidemic of dysentery that prevailed at Le-Roy,* [McLean county, Ill.,] *during the summer and autumn of* 1858, Chicago Med. Examiner, Vol. I, 1860, p. 659. J. H. DICKSON—*Med. topography and epidemics of North Carolina*, Trans. Amer. Med. Ass., Vol. XIII, 1860, p. 315. He says that dysentery in North Carolina is so often concurrent with intermittent and remittent fevers that many physicians believe them to arise from the same causes; but points out, against this view, that dysentery often prevails in mountainous districts where the periodic fevers never spontaneously originate.

*Number of cases taken on sick report each month with Acute Dysentery among the White troops, expressed in ratio per 1,000 of mean strength.*

*Atlantic Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1862.. | 16 | 13 | 9 | 8 | 7 | 5 | 4 | 4 | 7 | 12 | 12 | 12 | 98 |
| Year ending June 30, 1863.. | 12 | 9 | 8 | 11 | 8 | 7 | 6 | 5 | 4 | 4 | 9 | 9 | 86 |
| Year ending June 30, 1864.. | 9 | 9 | 11 | 8 | 6 | 4 | 2 | 2 | 1 | 3 | 6 | 13 | 72 |
| Year ending June 30, 1865.. | 12 | 11 | 9 | 8 | 6 | 4 | 3 | 3 | 3 | 4 | 7 | 8 | 76 |
| Year ending June 30, 1866.. | 8 | 6 | 5 | 5 | 4 | 2 | 3 | 2 | 2 | 4 | 4 | 4 | 62 |

*Central Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1862.. | 22 | 24 | 20 | 21 | 12 | 9 | 7 | 8 | 11 | 15 | 13 | 9 | 150 |
| Year ending June 30, 1863.. | 9 | 8 | 16 | 18 | 11 | 8 | 8 | 9 | 8 | 8 | 12 | 15 | 129 |
| Year ending June 30, 1864.. | 15 | 18 | 15 | 12 | 8 | 5 | 5 | 4 | 6 | 7 | 14 | 17 | 124 |
| Year ending June 30, 1865.. | 19 | 18 | 16 | 13 | 9 | 8 | 7 | 5 | 7 | 10 | 11 | 11 | 134 |
| Year ending June 30, 1866.. | 12 | 11 | 12 | 11 | 6 | 5 | 4 | 3 | 4 | 5 | 6 | 6 | 113 |

*Pacific Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1862.. | 6 | 4 | 5 | 4 | 5 | 3 | ..... | 2 | 5 | 4 | 4 | 18 | 54 |
| Year ending June 30, 1863.. | 17 | 5 | 6 | 6 | 3 | 2 | 3 | 1 | 1 | 2 | 3 | 3 | 53 |
| Year ending June 30, 1864.. | 3 | 5 | 4 | 3 | 2 | 1 | 1 | 2 | 3 | 3 | 2 | 1 | 30 |
| Year ending June 30, 1865.. | 2 | 4 | 5 | 5 | 3 | 1 | 2 | 2 | 2 | 1 | 1 | 3 | 28 |
| Year ending June 30, 1866.. | 2 | 3 | 4 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 4 | 2 | 27 |

*Number of cases taken on sick report each month with Acute Dysentery among the Colored troops, expressed in ratio per 1,000 of mean strength.*

*Atlantic Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1864.. | 26 | 24 | 23 | 11 | 8 | 5 | 4 | 2 | 6 | 9 | 15 | 18 | 124 |
| Year ending June 30, 1865.. | 19 | 17 | 16 | 15 | 6 | 7 | 13 | 7 | 7 | 8 | 12 | 10 | 132 |
| Year ending June 30, 1866.. | 10 | 8 | 5 | 4 | 6 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 69 |

*Central Region.*

| | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | For the year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year ending June 30, 1864.. | 22 | 21 | 18 | 19 | 12 | 10 | 10 | 8 | 13 | 15 | 19 | 19 | 178 |
| Year ending June 30, 1865.. | 18 | 19 | 18 | 13 | 10 | 9 | 8 | 7 | 10 | 12 | 14 | 15 | 154 |
| Year ending June 30, 1863.. | 14 | 12 | 9 | 13 | 8 | 8 | 6 | 6 | 6 | 5 | 6 | 8 | 113 |

The influence of season indicated by these ratios is corroborated by the experience of the United States Army in time of peace. The reports of both Forry and Coolidge* give the number of cases by quarters instead of by months. In these reports, the first quarter terminates March 31st, the second June 30th, the third September 30th, and the fourth December 31st. In both reports the greatest number of cases of both diarrhœa and dysentery is shown to have occurred during the third quarter.† The report of Coolidge gives the number of cases of diarrhœa and dysentery separately, and it is seen that their relation to season was very similar.

The relation of season to the mortality of dysentery among the civil population of the United States is well shown by the several census reports.‡ In the Census Reports of 1860 and 1870 the mortality is given by months, and in both years August was the month of the greatest mortality of dysentery.§ It will be seen that in both years the minimum occurred during the winter, the month of least mortality being February, in 1860, and January, in 1870. From the point of minimum the mortality steadily increases until May, when a very great increase takes place, and it then rapidly rises to the maximum in August, after which, diminishing considerably during September and October, it suddenly experiences a great fall in November, and then gradually diminishes to the month of min-

* See note to p. 416, *supra*.

† Frequency of *Diarrhœa* and *Dysentery* in the United States Army in time of peace in each quarter of the year, expressed in ratio per 1,000 of mean strength: The ratios from the report of COOLIDGE have been computed from a consolidation of his tables.

| | First quarter. | Second quarter. | Third quarter. | Fourth quarter. |
|---|---|---|---|---|
| Report of Forry, Diarrhœa and Dysentery | 54 | 107 | 166 | 75 |
| Report of Coolidge, Diarrhœa | 51 | 84 | 139 | 78 |
| Report of Coolidge, Dysentery | 14 | 26 | 37 | 22 |

‡ In the mortality report of the Census of 1850 the figures are given by quarters, as in the army reports just cited. The quarters, however, unfortunately do not exactly correspond. "Spring" embraces February, March and April; "summer," May, June and July; "autumn," August, September and October; and "winter," November, December and January. The number of deaths from diarrhœa and dysentery was as follows:

| | Spring. | Summer. | Autumn. | Winter. |
|---|---|---|---|---|
| Diarrhœa | 652 | 1,766 | 3,176 | 686 |
| Dysentery | 1,009 | 3,570 | 14,254 | 1,554 |

§ Monthly number of deaths from *Dysentery*, according to the Census Reports of 1860 and 1870:

| YEAR. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1860 | 273 | 233 | 254 | 336 | 829 | 899 | 1,473 | 2,519 | 1,570 | 1,009 | 353 | 264 |
| 1870 | 209 | 221 | 228 | 275 | 452 | 486 | 1,171 | 1,870 | 1,593 | 809 | 305 | 232 |

imum. The number of deaths from diarrhœa during the same years is added for comparison.* It will be seen that the fluctuations are very similar, and that the month of August is that of greatest mortality for both years.

These results with regard to the relation of dysentery to season are in close agreement with those collected by Hirsch† with regard to its endemic prevalence in Europe and other temperate regions in the northern hemisphere, and indeed with its epidemic occurrence in the same regions. Thus of 496 European epidemics, the period of greatest prevalence was during the spring in 11, spring and summer in 4, summer in 158, summer and autumn in 203, autumn in 103, autumn and winter in 6, and winter in 11. In the tropical regions of the northern hemisphere the period of maximum appears to be somewhat later—September to November; while in the southern hemisphere the maximum falls most frequently in the months of March or April. In all cases, the period of greatest prevalence appears to be either the latter portion of the hot season or the time of its gradual transition into colder weather.

Comparative frequency of Dysentery among the White and Colored troops.—The statistics of diarrhœa and dysentery discussed in Section I, and those relating to acute dysentery, presented a few pages above, show that dysentery during the civil war was both more frequent and more fatal among the colored troops than among the white. Some reasons have already been offered in explanation of this circumstance.‡ In confirmation of the opinion then advanced, a tabular view of the comparative mortality of dysentery among the white and colored civil population of the United States, according to the Census Reports for 1850 and 1870, is subjoined,§ and the figures for diarrhœa and enteritis have been added for comparison. The Census of 1860 is not available for this comparison, as the mortality of the white and colored races was not printed separately in it.

It will be seen from the table that the proportionate mortality of diarrhœa and enteritis, according to both Census Reports, was nearly the same for both races. The same is true for dysentery according to the Census of 1870, while in that of 1850 dysentery appears to have been more than three times as fatal among the whites. It must be remembered, however, that the Census of 1850 represents one of the years of epidemic dysentery in which, as has been shown, the epidemic influence was most extensively felt in the northern states; that is, just those states in which the negro population was very

* Monthly number of deaths from *Diarrhœa*, according to the Census Reports of 1860 and 1870:

| Year. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1860 | 227 | 195 | 231 | 296 | 703 | 791 | 1,300 | 1,744 | 1,161 | 651 | 303 | 222 |
| 1870 | 443 | 418 | 459 | 488 | 894 | 1,077 | 2,467 | 3,139 | 2,482 | 1,288 | 588 | 447 |

† Bd. II, S. 224 of work cited on p. 416, *supra*.

‡ See p. 8, *supra*.

§ Ratios of deaths from *Diarrhœa Dysentery* and *Enteritis* per 100,000 living persons, for white and colored separately:

| | 1850. | | 1870. | |
|---|---|---|---|---|
| | White. | Colored. | White. | Colored. |
| Dysentery | 99 | 31 | 20 | 20 |
| Diarrhœa | 27 | 27 | 36 | 38 |
| Enteritis | 12 | 13 | 24 | 20 |

small. If this circumstance is not admitted to account for the difference, it may be observed that this difference is in the opposite direction to that observed during the civil war, and that neither Census Report supports the opinion which has been drawn from the papers of Tidyman and Cartwright,* that dysentery is especially frequent and fatal among the negro race in the United States. For myself, I have been led to the conclusion that whatever differences may exist in the extent to which diarrhœa and dysentery prevail among the white and colored races in particular localities or at particular times, depend rather upon differences in the circumstances to which they are exposed than upon difference of race.

Relation of Dysentery to age and sex.—The military statistics of the civil war afford no convenient data for inquiring into the comparative frequency of dysentery among soldiers of different ages and different lengths of service. The Census Reports, already cited, show that while no age is exempt, as is indicated by the subjoined summary, children, especially those under five years of age, are peculiarly liable.† As to the sexes, a rather larger number of males would appear from the same Reports to die from the disease.‡

Second attacks.—Van Geuns§ declared that in his large experience he never saw any one who had once had dysentery again attacked by it, and brings forward the fact that those districts in Holland which suffered by the epidemic of 1779 were spared by that of 1783, in support of the opinion that, as by small-pox and scarlatina, the constitution of the patient is so modified by an attack of dysentery as to exempt him from a repetition of the disease. On the other hand, Catteloup‖ states that in the military hospital of Tlemcen about one in ten of the dysenteric patients admitted had suffered from dysentery previously,

* P. Tidyman—*A sketch of the most remarkable diseases of the Negroes of the Southern States*, Philadelphia Jour. of Med. and Phys. Sciences, Vol. XII, 1826, p. 329: "There is no disease in the autumnal season which prevails more commonly among the blacks than dysentery, and it is frequently very fatal, unless arrested by seasonable attention." S. A. Cartwright—*Remarks on dysentery among negroes*, The New Orleans Med. and Surg. Jour., Vol. II, 1854, p. 145. This paper refers to local epidemics on certain plantations in south Alabama during 1851–52 and 1854, which the author did not witness himself. The paper is a curious one on account of the vigor with which the writer combats what he evidently regards as a most fatal error, that the "negro is a black white man," resembling the superior race in every quality "except that of having white skins." H. V. Wooten [of Lowndesboro', Alabama]—*Dysentery among negroes*, same Volume, Jan., 1855, p. 448—replies to Dr. Cartwright's article, and denies "that the epidemic dysentery of south Alabama is confined to, or particularly fatal amongst, the negro population."

† Ages of those who died of *Dysentery*, according to the Census Reports of 1850, 1860 and 1870:

| Year. | Under 5 years. | 5 and under 10. | 10 and under 20. | 20 and under 50. | Over 50. |
|---|---|---|---|---|---|
| 1850 | 11,475 | 2,172 | 1,439 | 3,267 | 2,218 |
| 1860 | 7,151 | 718 | 439 | 1,244 | 906 |
| 1870 | 5,004 | 431 | 326 | 1,013 | 1,133 |

Mr. E. B. Elliott, the well known statistician, has furnished me the following table, which shows the probable proportion of living persons of the ages specified in the table: Number of persons living at certain ages of life in a constant population supplied by 1,000,000 annual births, according to Mr. E. B. Elliott's *United States Life-Table* for the year 1870:

| | | | | | |
|---|---|---|---|---|---|
| Under age of 5 | 4,009,240 | From 10 to 20 | 6,776,490 | Over age of 50 | 8,677,640 |
| From 5 to 10 | 3,575,640 | From 20 to 50 | 16,215,410 | Total population (all ages) | 39,254,420 |

If this distribution of population be compared with the figures given in the table for 1870, it will be seen that the proportion of deaths to population steadily diminishes up to the period from 20 to 50, during which it is somewhat increased, while after 50 it is very decidedly greater than between 20 and 50. The figures for the other years indicate a similar distribution, except that in 1850 the increase between 20 and 50 is not noted.

‡ Sexes of those who died of *Dysentery*, according to the Census Reports of 1850, 1860 and 1870:

| Year. | Males. | Females. |
|---|---|---|
| 1850 | 10,928 | 9,628 |
| 1860 | 5,630 | 4,838 |
| 1870 | 4,270 | 3,642 |

§ M. van Geuns—*Abhandlung über die epidemische Ruhr, besonders des Jahrs 1783, aus dem Holländischen übersetzt*, Dusseldorf, 1790, S. 134 *et seq.*

‖ Catteloup—*Rech. sur la dyssenterie du nord de l'Afrique*, Recueil de Mém. de Méd., de Chir. et de Pharm. Militaires, T. VII, 1851, p. 99: "Dyssenteries de première invasion 989, dyssenteries récidivées 112, total 1101." These were all acute attacks. Catteloup, however, seemed inclined to admit that the first attack exercises a modifying influence, for he adds the further statistical facts that of the 989 first attacks 110 died, while of the 112 second attacks but 8 died.

and asserted that in the course of three years' service he had seen several soldiers have each as many as five attacks. In our military experience, second and third attacks were of very common occurrence; the first attack, even when the patient appeared to have completely recovered, leaving the bowels very susceptible to disturbing influences of every kind, so that relapses were readily provoked. I think it probable that in very many of these cases the disease was at first merely of the catarrhal variety, and that very often the intestine did not fully regain its normal condition between the attacks; but I have no doubt whatever of the possibility of second attacks of diphtheritic dysentery, even after years of health have elapsed, and should always expect, when dysentery began to prevail at the commencement of a campaign, that the officers and men who might have suffered from it in former wars would be among the first victims.

POST MORTEM APPEARANCES IN ACUTE DYSENTERY.—The anatomical lesions of dysentery have been so well described by some of the Greek physicians, especially Aretæus and Archigenes, as to make it quite certain that their knowledge must have been drawn either directly or indirectly from the post mortem examination of subjects dead of that disease. Such examinations were probably not infrequently made by the Alexandrian Greeks after Herophilus and Erasistratus had been permitted to dissect human bodies by the first Ptolemy; but the advanced condition to which these celebrated men appear to have brought human anatomy seems to render it very unlikely that they could have been, as some think, the first to dissect human bodies intelligently.

From several independent sources we are informed that such dissections had long before been made by the ancient Egyptians,* whose custom of embalming the dead was

* The author of the treatise *Introductio seu Medicus*, which has been ascribed to GALEN, [Ed. Kühn, XIV, p. 675,] while recording that such dissections were made by the Egyptians, seems to have regarded the results as chiefly valuable to surgery, remarking: "Porro ex cadaverum dissectione, quam in condiendis iis habere moris erat, multa etiam, quæ manu administrantur, apud primos medicos inventa esse videntur." PLINY, however, declared that the Egyptian kings dissected the bodies of the dead for the purpose of investigating diseases. In speaking of the medical virtues of the juice of the radish he remarks: "Tradunt et præcordiis necessarium hunc succum: quando phthisin (phthiriasin?) cordi intus inhærentem non alio potuisse depelli compertum sit in Ægypto regibus corpora mortuorum ad scrutandos morbos insectantibus," *Nat. Hist.*, Lib. XIX, Cap. 26, [Valpy's Ed., London, 1826, Vol. VI, p. 3015.] His nephew, C. PLINIUS SECUNDUS—*De Re Medica*, Lib. IV, Cap. 1, in Med. Antiqui, etc., Venice, 1547, fol. 201—has given the following paraphrase of this passage: "Contra phthiriasim succus ejus adhibetur, qui solus potest tenuitate subtili adimi corporis lineamenta, cor penetrare. Aegyptii enim reges, quibus erat studium scrutari corpora mortuorum, et causas valetudinum, occulta fide recognoscere, in corde ipso nasci ejusmodi vitium, prodiderunt." The Egyptian historian MANETHOS, who lived in the reign of Ptolemy Philadelphus, declared, if we may believe EUSEBIUS—Lib. I, *Chronicorum*, Cap. XX, § 4, Opera, T. I, Columna 184, Edit. Migne, Paris, 1857–66—that ATHOTIS, (also Athostis, Athothis, Athot, Thot, &c.,) king of Egypt, was both physician and anatomist, and that he wrote books on anatomy, ("*καὶ βίβλους ἀνατομικὰς συνέγραψε.*") This king was the successor of MENES, and began to reign, according to the compilation of Count J. POTOCKI—*Chronologie des deux premiers Livres de Manethon*, St. Petersburg, 1805, p. 1—in the year 3609 B. C. According to D. M. J. HENRY—*L'Égypte Pharaonique*, Paris, 1846, T. I, p. 132—in the year 5241 B. C. Various other estimates of the date of this king have been made, which, however, are of no importance to our present purpose, since all place him many centuries before the time of the Ptolemies. According to CLEMENT of ALEXANDRIA—*Stromata*, Lib. VI, Cap. 4, Opera, Potter's Ed., Oxford, 1715, p. 758—the ancient Egyptians possessed six Hermetic Books of Medicine treating severally of Anatomy, of Diseases, of Surgical instruments, of Pharmacy, of the Eye and of Diseases of Women. HENRY—*op. cit.*, T. II, p. 113—believed that of these Hermetic Books, that treating of Anatomy was the work which MANETHOS ascribed to ATHOSIS. It is probable that the culmination of Egyptian medical knowledge was reached long before the time of ARISTOTLE; for he refers to the existence of an Egyptian law which compelled physicians to practice according to written rules for the first four days of sickness: "Et in Ægypto post diem quartum movere licet medicis: quodsi ante id tempus facere coguntur, suo periculo faciunt," *Politica*, Lib. III, Cap. 10, (15,) Paris Ed., 1848–54, T. I, p. 535. DIODORUS SICULUS—*Bibliothecæ Historicæ* Lib. I, Cap. 82, C. Müller's Ed., Paris, 1843, T. I, p. 66—gives the same law in more detail, though he does not refer to the permission to deviate from the written code after a four days' trial: "Medici enim annonam ex publico accipiunt, et medicinam ex lege scripta, per multos ab antiquo medicos illustres concinnatam, applicant. Si leges, quas sacri codicis lectio tradit, secuti ægroto sanitatem reddere nequeant, culpa vacant, et indemnes abeunt; sin contra præscriptum agant, capitis judicium subeunt. Nam medendi rationem longi temporis usu observatam et ab optimis artificibus ordinatam paucos ingenio et sollertia superaturos legislator censuit." After such a custom had once been established the progress of medical science must soon have been checked, and a demand would be created for authoritative compilations, such as those enumerated by CLEMENT of ALEXANDRIA. As mentioned in the text, many medical historians have been inclined, nevertheless, to believe that the anatomical notions acquired by the Egyptians were of the rudest kind. This was the opinion of HERMAN CONRING—*De Hermetica Ægyptiorum veteri et nova Paracelsicorum medicina*, Helmstadt, 1648, [I cite the Ed. of 1669]—as may be seen, especially in Lib. I, Cap. 10, p. 89, which is headed, "Physiologiam et Pathologiam Ægyptiacam humani corporis, partim rudem fuisse, partim ineptam: parum certe habuisse veræ scientiæ." Similar views were entertained by LE CLERC—*Hist. de la Méd.*, 1696, I cite the English transl., London, 1699, p. 18; by J. H. SCHULZE—*Hist. med.*, Leipsic, 1728, Period I, Sect. I, Cap. 3, p. 23; D. P. GERIKE—*Programma de Athotis Tosarthri et antiquissimorum Ægyptiorum anatomia fabulosa*, etc., Helmstadt, 1739; HALLER—*Bibl. Anat.*, 1774, T. I, p. 7; and SPRENGEL—*Geschichte der Arzneykunde*, 3te Aufl., Bd. I, Halle, 1821, S. 61 *et seq.* Even J. HYRTL—*Antiquitates anat. rariores*, Vienna, 1835, p. 47 *et seq.*—who seems disposed to take a more favorable view, and who states, among other circumstances, that mummies have been discovered whose parts were sewed together, showing that the interior of the body was not inaccessible to the curious in those ancient times, expresses his belief (p. 57) that no one of sound mind will contend that bodies were dissected by the ancient Egyptians with much art.

favorable to the pursuit of anatomy; and although many writers on medical history have inclined to the opinion that the anatomical notions thus acquired were of the rudest kind, yet it must be confessed that the additions to our knowledge of Egyptian culture made during the present century have been of a character to increase our respect for ancient Egyptian medicine, and to favor the opinion of those who hold that the anatomical knowledge possessed by the Egyptians before the Greek conquest was at least fairly comparable with that which they had acquired in other sciences of observation.

Nor does it seem unlikely, when we consider the circumstances under which the wonderful intellectual development of the Alexandrine Greeks took place, that they were largely indebted in the matter of anatomy as well as in so many other directions, to the learned men of the conquered nation; or that Herophilus and Erasistratus* were fortunate not merely in receiving from a Greek prince permission to dissect human bodies, but also in obtaining that permission at such a time and place that it was possible for them to enjoy the instruction of the Egyptian anatomists. How much knowledge of pathological anatomy was acquired by the Alexandrine School, either from the Egyptians or independently from Greek investigation, is a matter of uncertainty, since only a few fragments of its medical writings have been handed down to us; but if, as seems probable, the descriptions of the dysenteric lesions found in the writings of Aretæus and Archigenes† were derived from that source, its acquaintance with pathological anatomy must have compared favorably with the knowledge of normal anatomy for which it enjoys a well deserved reputation.

On the other hand, a higher estimate of Egyptian anatomy has been entertained by several writers, among the more modern of whom I may particularly mention HENRY—*op cit., supra*, T. II, p. 107 *et seq.*, and M. S. HOUDART—*Hist. de la Méd. Grecque*, Paris, 1856, p. 45—whose posthumous work published under the auspices of CH. DAREMBERG, contains a very interesting essay on Egyptian medicine—Livre II, De la médecine chez les Egyptiens. Quite recently the publication, under the auspices of the German government, of a fac-simile of the very perfect papyrus discovered a few years since by GEORG EBERS—*Papyros Ebers das hermetische Buch über die Arzeneimittel der alten Ägypter in hieratischer Schrift*, Leipsic, 1875—has thrown new light on Egyptian medicine. A calendar on the back of the scroll would seem to show that it must have been written about the year 1552 before Christ, and its contents appear to indicate that it is in fact the Hermetic book on Pharmacy. This remarkable work is evidently a compilation from various sources which were already ancient when it was written. If the opinions formed of its age are correct, it shows that, more than a thousand years before HIPPOCRATES, Egyptian medicine had made most respectable progress. It is full of prescriptions in which the medicaments are set down in order, with the quantities of the liquids indicated by measure, that of the solids by weight. They are grouped in accordance with an anatomical classification of diseases. Among them are a number (on Taf. 30–35) for heat, burning and pain in the lower bowel and anus, from which we may infer that dysentery had already attracted considerable attention. The names of the medicines and of the diseases mentioned are, it is true, as yet for the most part untranslated, but enough has been made out to increase materially our respect for old Egyptian medicine, and to make us regret more than ever that we do not possess the other Hermetic books, especially those on anatomy and diseases, which would probably throw a flood of light on the sources of many of the pathological doctrines of the Greek physicians, who undoubtedly drew a considerable part of their medical knowledge from Egypt.

* The first PTOLEMY (P. Lagus, or Soter) gave permission to HEROPHILUS, and probably to ERASISTRATUS, to dissect human bodies. (Compare HALLER, cited in last note, T. I, p. 56, with SPRENGEL, cited in last note, Bd. I, S. 533 *et seq.*, for summary accounts of the various opinions with regard to the date and place in which the latter practiced anatomy.) They made good use of their opportunities, and their anatomical writings obtained great credit among the Greeks. CELSUS—Lib. I, *Prefatio*, Lee's Ed., Vol. I, London, 1831, p. 8—has accused them of having obtained by royal edict criminals out of prison for dissection alive, and TERTULLIAN—*De anima Liber*, Cap. IX, "Anima et spiritus, vivere et spirare, unum atque idem est," Opera, Paris Ed., 1658, T. I, p. 9—with malignant exaggeration sets down the number of victims thus butchered by HEROPHILUS at six hundred. But it may well be doubted whether these accusations have any foundation in facts; they are not even alluded to by GALEN, PLINY, RUFUS THE EPHESIAN or CÆLIUS AURELIANUS, all of whom have preserved fragments of the observations and opinions of these anatomists. The Alexandrine School of Medicine, of which they may be regarded as the founders, prospered for a long time. More than six hundred years later AMMIANUS MARCELLINUS—Lib. XXII, Cap. 16, § 18, Tauchnitz Ed., Leipsic, 1867, p. 275—declared that it was sufficient to secure credit to a physician anywhere to have it known that he had studied in Alexandria. Several of the earlier physicians of this school wrote on anatomical subjects, (compare HALLER and SPRENGEL, cited above,) but as their writings have perished it is not possible to say how far they cultivated pathological anatomy.

† ARETÆUS—*De Causis et Signis Morb. Diut.*, Lib. II, Cap. 9, Boerhaave's Ed., 1731, p. 59; ARCHIGENES—In *Actius*, Tetrab. III, Serm. I, Cap. 43, Lyons Ed., 1549, p. 599. The descriptions of the lesions of dysentery given by these authors are so nature-true that it is impossible to believe them to be conjectural or speculative. Directly or indirectly they must have been derived from actual observation. Note particularly the account given by ARETÆUS of the sloughing of considerable portions of the internal tunic of the colon in certain cases of dysentery, and the comparison drawn by ARCHIGENES between the lesions of the dysenteric intestine and the papules and ulcers of certain skin diseases; a comparison which has been repeated with approval by one of the most acute observers of pathologico-anatomical processes of the present century, ROKITANSKY—*loc. cit.*, note ; to p. 570, *supra*. We know so little of the history of these men that the sources of their knowledge of the dysenteric lesions must remain uncertain. The most probable conjecture is that it was drawn from Alexandria. I cannot, therefore, agree with the learned C. G. ACKERMANN—*De Dysenteriæ Antiquitatibus*, Leipsic, 1777—that the Greek physicians understood by the expression ulceration of the intestines something different from what we now mean by that phrase. This writer has correctly pointed out that in the so-called bloody, hepatic and atrabiliary forms of dysentery (see note ; to p. 33 , *supra*) the idea of intestinal ulceration was not involved; nay, that even in dysenteria propria (d. ulcerosa of the Greeks) the first grade or stage of GALEN (see p. 345, *supra*) existed without ulceration, and he inferred, therefore, that the Greeks believed rather that ulceration resulted from dysentery than that it caused it, [pp. 45 and 72.] Indeed he was so thoroughly convinced (as others of his times also were) that intestinal ulceration is a rare complication in dysentery, that he admits with the greatest reluctance that the Greek physicians, whom he warmly admired, believed it to be a frequent accident. He offered two explanations of their language on the subject. On the one hand, he suggested that modern therapeutics had advanced so far in his day that dysentery

Both Aretæus and Archigenes included in their conception of dysentery forms corresponding to what we now call typhoid fever, and accordingly they gave a prominence to ulceration of the small intestine in dysentery which does not accord with our modern limitation of the disease.* In this and other particulars their descriptions of the dysenteric lesions were long pretty closely followed by medical writers, who were unable to improve or modify them because they made no dissections.

The enlightened views of the Alexandrine school with regard to human dissections, resisted everywhere else by superstition, took no root beyond the soil of Egypt. Neither Galen, Celsus nor any of the subsequent Greek or Roman physicians appear to have dissected human bodies, and the same remark applies to the Arabians.† Human anatomy,

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was generally cut short before it progressed to ulceration; whereas the Greek physicians, not enjoying these modern advantages, were unable to prevent this from happening, (p. 71.) On the other hand, he asserts that the word ulceration was used in a much broader sense by the ancients than in modern times; and that, hence, when they spoke of ulceration of the intestines they really meant only in a general way that the intestines were diseased; "veteres medici sub hac voce nihil aliud intellexerint, quam ipsum generale id, quod intestina ab humore ea alluente male afficerentur," (p. 36.) In support of this ingenious speculation he appeals to the doctrine of GALEN with regard to the form of lassitude called ulcerous, which he thinks conclusive evidence in his favor. I do not believe, however, that this doctrine had any practical influence on the use made by the Greeks of the name ulcer, (ἕλκος,) which I find everywhere employed in the very same sense as at the present day. GALEN expressly tells us that an ulcer is a solution of continuity; compare *De Inaequali Intemperie*, Cap. 6, [Ed. Kühn, VII, p. 745,] and *De Morb. Causis*, Cap. 11, [*op. cit.*, p. 38;] and his descriptions of the dysenteric process, taken in connection with those of ARCHIGENES and ARETÆUS, leave no doubt that intestinal ulceration, as understood in those days, was actual ulceration with loss of substance. At the same time it must be admitted that the Greeks used the adjective ulcerous (ἑλκώδης) in a more extended sense than we do. They saw that ulcers vary in extent from great chasms to almost imperceptibly minute losses of substance, and they had no microscope to follow the process after it escaped the vision of the unaided eye. What more reasonable to them than the speculation that ulcers, too minute to be seen, might account for many of the phenomena of disease, especially for pain, even when no solution of continuity could be detected by the eye? In this sense I understand the language of HIPPOCRATES in the treatise *De Fracturis*, § 31, [Ed. Littré, III, p. 527.] He has just said that on the third or fourth day after a fracture, whether simple or compound, the pressure of bandages and other interference should be avoided, because, at about this time after an injury, an inflammatory condition in the injured part is apt to occur, which tends to produce fever, and nothing should be done to aggravate this natural tendency. The passage which follows reads in the accepted Latin version: "Quid enim est præcipui in re medica usus non in ulceribus modo, verum etiam multis in aliis morbis, cum quo communionem non habeat? Nisi si quis alios quoque morbos ulcera esse dixerit. Quæ sane oratio quandam habet probabilitatem. Multis enim modis alii cum aliis cognationem habent," [Kühn's Edition of HIPPOCRATES, T. III, Leipsic, 1827, p. 116.] Now the Greek word, (ἕλκεα,) which is here translated ulcers, is translated wounds both by LITTRÉ *(loc. cit.)* and ADAMS, [Transl. of Sydenham Society, Vol. II, p. 540.] The English version of the latter reads as follows: "And if any piece of information be particularly valuable this is; to which of the most important cases in medicine does it not apply? and that not only in wounds but in many other diseases, unless one should call all other diseases wounds. And this doctrine is not devoid of a certain degree of plausibility, for they are allied to one another in many respects." GALEN, however, seems to have understood HIPPOCRATES to refer to ulcers, as plainly appears from his commentary on this passage, *Comm. III in Hippoc. de Fract. Lib.*, § 34, [Ed. Kühn, XVIII, B, p. 586,] in which he himself arrives at the conclusion that painful diseases, at least, may be classified with ulcers, since a solution of continuity, which is characteristic of ulceration, is known to give rise to pain. See also *De Inaequali Intemperie Liber*, Cap. 6, [*op. cit.*, VII, p. 745,] where he remarks, "ut alicubi et Hippocrates ait, proferens omnes morbos esse ulcera." Similar notions underlie the doctrine of ulcerous lassitude referred to by ACKERMANN. It would take more space than can be spared here to discuss the general doctrine of lassitude and its varieties as understood by the Greeks. The reader may consult GALEN—*De Sanitate tuenda*, Lib. III, Cap. 5–8, [Ed. Kühn, VI, p. 190 *et seq.*,] where the subject is treated of at length, very probably after the teachings of THEOPHRASTUS, who, according to GALEN, wrote a special treatise on this subject. See also ÆTIUS, Tetrab. I, Sermo IV, Cap. 35–44. The lassitude which follows excessive gymnastic exercises, or the fatigue of journeys, is taken as the type of spontaneous lassitude, such as that which precedes fevers, and each is similarly subdivided; ulcerous lassitude is so called because the sensation in the skin and beneath it, which immediately precedes the horror or rigor, was supposed to resemble the sensations which accompany ordinary ulcers, partly because the actual, though invisible, solutions of continuity which produced these sensations were supposed to be caused by the vellicating or vulnerating action of irritating humors in the skin or the tender flesh beneath it. I regard this doctrine merely as the result of an effort to explain certain ill-understood morbid conditions by comparing them with other coarser and more readily comprehended lesions. And I do not think that ACKERMANN could have been induced to suppose that this use of the word ulcerous had anything to do with Greek opinion as to dysentery, had he not himself believed that ulceration was much rarer in dysentery than it really is.

* ARETÆUS says *(loc. cit.)* that if the ulcers of the small intestine become excavated and phagedenic (κοῖλα καὶ ἀνεσθίοντα) acute fevers set in, which in some cases are latent and smoulder in the intestines; in other cases ardent fevers (καυσώδεες) occur accompanied by prostration of strength, thirst, anxiety, dry tongue and small feeble pulse. ARCHIGENES also *(loc. cit.)* asserts that those who suffer from ulcerations of the small intestine are tormented by thirst, and that sometimes malignant fevers arise; "dolor quoque vehemens supra umbilicum considet, quandoque et febres malignæ oboriuntur." LIEBERMEISTER—*Ziemssen's Cyclop.*, Amer. Ed., Vol. I, New York, 1874, p. 42—has recently expressed doubts "whether any of the different forms of dysentery and intestinal ulcers described by Aretæus belong to typhoid fever," remarking that "The intestinal lesions in typhoid fever are not so striking, to those who make no autopsies and only observe symptoms, as to be considered an essential feature." But I must believe the descriptions of ARETÆUS to have been drawn not merely from observation of symptoms, but from ocular examination of the intestines either by himself or by those from whom he obtained his knowledge. I may add that the custom of inspecting the entrails, which formed a part of the ceremony of embalming, must have given to the ancient Egyptians ample opportunities for observing intestinal ulcers, and that typhoid ulcers are quite as conspicuous as the ulcers of dysentery. The knowledge thus acquired would probably have been enlarged and extended by the Alexandrine school, and we shall see that the view which regarded these ulcers of the small intestine as a variety of dysentery, continued to find favor until the time of MORGAGNI and even later.

† Compare, on this subject, the opinions of HALLER and SPRENGEL in the works cited above. Rude attempts at dissection were undoubtedly made at various times during this period, which bore little fruit on account of the imperfect training of those who made them. Thus, according to GALEN, the physicians who accompanied the Roman army in the German war, though they found occasion to dissect the dead bodies of the slain barbarians, learned no more by their efforts than is understood by cooks.—*De Comp. Med.*, Lib. III, Cap. 2, [Ed. Kühn, XIII, p. 604.] PROCOPIUS—*De Bello Persico*, Lib. II, Cap. 23, Bonn, 1833, T. I, p. 251—relates that during the plague which devastated Constantinople in the year 543, the physicians dissected some of those who died in hopes of getting a better understanding of the disease; but in this case the investigation appears to have been limited to a mere incision into the buboes: "Medici quidam, cum in his exercuirent accessionibus morbi, ejusque caput in buhonibus residere secretum rati, defunctorum cadavera scrutari decrevissent; dissectis tuberibus aliquot, enatos ibi carbunculos teterrimos deprehenderunt." An interesting account of this plague is given by GIBBON—*Decline and Fall of the Roman Empire*, Chap. 43. See also J. FREIND—*History of Physick*, 3d Ed., London, 1726, Part I, p. 156.

long neglected, was first again revived by Mundinus of Bologna* at the commencement of the fourteenth century, and it was nearly two hundred years later that the earliest autopsies of individual cases of dysentery, which have been preserved to the present day, were published in the posthumous work of Antonio Benivieni,† (1506–7.) Several additional autopsies of dysenteric subjects were made by Hollerius,‡ who died in 1562, and these were the only ones besides those of Benivieni which Schenckius § was able to collect for his encyclopedic work, (1584–97.) After this, observations began to multiply, so that Bonetus ‖ obtained for his Sepulchretum (1679) a number of additional autopsies, among which, in spite of the imperfect character of the descriptions, it is possible to recognize the more important varieties of the dysenteric lesions. Morgagni ¶ (1762) found still richer material at his disposal, and being an agreeable writer, exercised a greater influence on the formation of modern opinion than his less gifted but laborious predecessor.

Like Aretæus and Archigenes, both Bonetus and Morgagni embraced the ulcerations of typhoid fever in their conception of dysentery. The discovery by Peyer of the closed glands, which still bear his name, at first only appeared to strengthen this opinion. Peyer** himself (1677) regarded the glandular plexuses of the ileum as favorite seats for the dysenteric ulcers, especially in epidemic dysentery, and Bonetus †† quoted this opinion with approval.

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* MUNDINUS dissected the body of a human female in the year 1306; afterwards in 1315 he publicly dissected two others, and, continuing his researches, published a work on human anatomy based on his own observations; [HALLER, T. I, p. 146, *op. cit.*, note * p. 432.] There are in the library of the Surgeon General's Office two black-letter copies of the *Anatomy* of MUNDINUS; one published in Pavia, 1507, the other without date. After his time public dissections of human subjects came into vogue in all the universities, at least as an occasional practice; (SPRENGEL, *op. cit.*, S. 611.) Among those who distinguished themselves by their anatomical pursuits in these early days I may particularly mention BARTHOLOMÆUS MONTAGNANA, who died at Padua about 1460—*Selectiorum Operum Lib. unus et alter*, Frankfort, 1604, p. 582—and who states, in speaking of the circumstance that fæcal matters are not found in the jejunum, that he himself had personally observed this fact in fourteen dissections of human bodies; "ut in XIV corporibus humanis anatomice sectis oculus meus testificatus est."

† ANTONIO BENIVIENI—*De abditis nonnullis ac mirandis morborum ac sanationum causis*, Florence, 1506–7. I cite the Paris Ed. of 1529, bound up with CELSUS, SCRIBONIUS LARGUS, &c. He died in the year 1502. The cases referred to in the text are two in number, of which the second clearly represents an actual autopsy, but I doubt greatly whether this is true of the first. As they are the earliest examples of this class of observations I append a translation of them, (*op. cit.*, fol. 18–19:) "XCV. *The villi, by which the retaining power (of the bowel) is sustained, eroded by a preceding dysentery.* Tormina of the intestines, which the Greeks call dysentery, usually ulcerate the intestines internally, and thence bloody and mucous excrements descend; and when that disease lasts long it either carries off the patient, or, which perchance is worse, it remains incurable. We knew a certain Julian who was troubled with this disease for forty days, at the end of which his pains and desire of going to stool ceased. His bowels remained in a very loose condition, and were moved exceedingly often. He could not be cured by any means; nor was he ever able as long as he lived to restrain the violence of his bowels, but in whatever place the desire of going to stool seized him, he there relieved himself. This condition was doubtless produced by the preceding tormina ulcerating and consuming the villi, on which the retaining power itself depends. XCVI. *The viscera eroded by a similar dysentery.* We have also seen another man, a native of Aretium, who was troubled even still longer with these tormina, which finally caused eroding ulcers of the intestines themselves, afterwards a tabes, and at last death. The viscera (intestines) displayed internal erosion, from which sanies was continually discharged while it remained thus affected, which did not exceed three years."

‡ JAC. HOLLERIUS—*De Morbis Internis*, Lib. I, Cap. 43, *Scholia*; this work was published posthumously, Paris, 1565, its author having died in 1562; I cite Opera, Geneva, 1623, p. 353—published three autopsies of dysenteries. In the first, a child 12 years old, the rectum was found ulcerated, the interior of the œsophagus and the epiploon "corrupted," the lungs "altered"; in the second an ulcer had penetrated all the coats of the stomach near the pylorus; in the third a great quantity of pus was found in the intestines.

§ J. SCHENCKIUS—*Obs. Med., Rar.*, Lib. VII, 1584–97; I cite the Frankfort Ed., 1609, p. 387 *et seq.*

‖ THEOPHILUS BONETUS—*Sepulchretum*, Geneva, 1679—tells us in his preface that PETER CASTELLI (who died about 1656–8) collected, under the title "Sepulchretum," accounts of about two hundred autopsies: "*Pet. Castellum*, Medicum Romanum, necroturises amplissimo professum, ne justo has volumine complexum notat *Marcus Aur. Severinus* lib. de Abscessibus pag. m. 187. Eundem ducentorum cadaverum eviscieratorum historias collegisse, titulo *Sepulchreti* emittendas, asserit Clar *Velschius* [George J. Welsch] initio Sylloges Observationum." The loss of this work, which was never published, must be regretted. In the *Sepulchretum* of BONETUS the principal lesions of dysentery are very fairly illustrated. Cases are related, for example, in which the large intestine was tumid and inflamed, (Obs. 8;) the intestines were inflated and their internal tunics abraded, (Obs. 6;) ulcers and abscesses were found from the beginning of the colon to the end of the rectum, (Obs. 2;) ulcers and cavities the size of half a pea (follicular ulcers?) were found in the rectum, (Obs. 12;) the intestines were gangrenous, (diphtheritic dysentery?) (Obs. 9;) extreme tenuity of the intestine was observed in chronic fluxes, (Obs. 20;) abscess of the liver complicated dysentery, (Obs. 18, 19, 23 and 25;) the spleen was enlarged, (Obs. 24.) &c., &c.

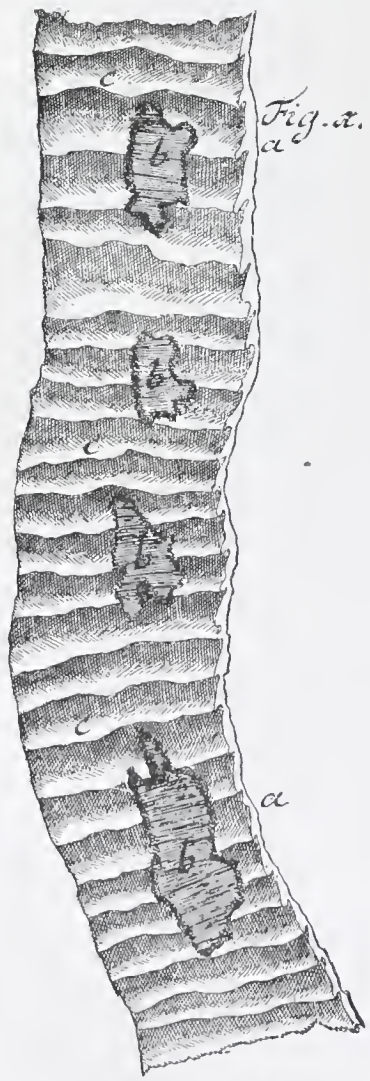
¶ J. B. MORGAGNI—*De Sedibus et Causis Morborum per Anatomen Indagatis*, Venice, 1762, Epist. XXXI. Here, too, should be mentioned the autopsies of dysenteric subjects collected by J. LIEUTAUD—*Historia Anatomico-Medica, etc.*, Paris, 1767, Lib. I, Sect. 4, T. I, p. 80 *et seq.*

** J. C. PEYER—*Exerc. anat. med. de glandulis intestinorum*, Pars II, Cap. 8 and 9, 1677; I cite the reprint in the *Bibl. Anat.* of MANGETUS, Geneva, 1685, T. I, p. 125 *et seq.*—believed that the cause of diarrhœa, lientery, the cœliac passion, dysentery, colic, the iliac passion and tenesmus was very often at least to be found in disease of these glands. Especially did he think this was the case in epidemic dysenteries. (Cap. 9.)

†† BONETUS *(loc. cit.)* gives in Obs. 3 an undoubted case of typhoid fever in which the small intestine was found here and there sphacelated, its tunic eroded and in four places perforated. In the scholia he cites the opinion of WEDEL that similar gangrenous cases are sometimes accompanied by mental hebetude: "Mentem simul laborare interdum, et doloris lancinantis faces non sentiri in phrenitide alibique conspicuum est." In Obs. 4 he cites a possible case from BARTHOLINUS of a woman dead of dysentery in whose intestines purulent tubercles abounded, and in the scholia makes a long extract from Cap. 9 of the essay of PEYER, quoted in the last note. I have examined the original of this case, BARTHOLINUS—*Hist. anat. et med. rar.*, Cent. VI, Hist. 2, Copenhagen, 1661, p. 201—but without finding any additional particulars. The report leaves it uncertain whether the "tubercles" were in the small intestine or the large.

Brunner,* who not long after contributed additional information with regard to the intestinal glands, describes a case of protracted flux in which the intestinal ulcers were, in his opinion, undoubtedly seated in the glandular plexuses of Peyer. Morgagni,† who willingly accepted the same view, cites this case in connection with several others of a similar tenor. Among them is one recorded by Bassius‡ (1731) of ulceration of the ileum consecutive to dysentery, which is illustrated by an etching on copper sufficiently well executed to remove all doubt as to the character of the ulcers. That Morgagni, with this plate before him, regarded the case as one of dysentery, shows clearly the nature of his own views as to this point. In what manner correct notions of the relation between the characteristic lesions of Peyer's patches and a specific form of continued fever were subsequently attained, will be shown hereafter in the chapter on camp fevers. Let it suffice at present to mention the names of Petit and Serres§ among the pioneers in this reform.

I have already indicated that Morgagni, while freely admitting that ulceration of the intestine is frequently found in the bodies of subjects dead of dysentery,‖ showed more fully than his predecessors that dysentery may prove fatal without intestinal ulceration,¶




* BRUNNER: I have not had access to the original of this case, which is cited by MORGAGNI—*op. cit.*, Epist. XXXI, § 13 and 15.

† MORGAGNI—*Op. cit.*, Epist. XXXI, § 15. I note that the case of VALSALVA, described in § 2 and 3, and spoken of in § 13 as a "young man, in whom a diarrhœa, without tormina, succeeding to a dysentery, he found the latter part of the ileum and the first part of the colon ulcerated," which is often cited as a case of typhoid fever, was really an example of what I call typho-malarial fever; "a simple tertian" intermittent fever of a month's duration being followed by a typhoid stage which proved fatal about the 14th day.

‡ H. BASSIUS—*Obs. Anat. Chir. Med.*, Halle, 1731, Decad. III, Obs. 7, also Tab. XI, Fig. 1, "Ilei exulceratio notabilis dysenteriæ pedissequa." The patient was a woman 42 years old, who is said to have been attacked with dysentery in the autumn of 1726, after partial recovery from which she continued to have two or three mucous stools daily, together with a constant gnawing pain about the umbilicus. These symptoms continued till the following spring, when a slow fever set in, which by and by changed into a hectic, and the patient died in a state of extreme emaciation. The autopsy was made April 20, 1727. The abdomen only was opened, in which most of the viscera were found in a normal condition. The liver was infarcted and wonderfully distended. The exterior of the intestines displayed a number of blackish spots and striæ, scattered here and there, which were supposed to indicate the existence of gangrene. The capacity of the intestinal canal was quite irregular, especially in the ileum, where, in different places, it was alternately contracted and dilated. The contents of the ileum being propelled downward, two ligatures were tightly applied, and a piece about half an ell long was dissected out. This being opened, was found to present a number of ulcers, which lay in a continuous series like the links of a chain, at the distance of about a finger's breadth, or sometimes of a joint of the thumb, from each other. "The glandular plexuses of Peyer, in other cases sufficiently conspicuous, were wanting in this case; hence it seems not unwarranted to suspect, especially since the ulcerous erosions were found at about the same distance from each other and in the same situation in which the aforesaid glands are located, that they were eaten up and consumed by the ulceration, and that the erosion of the ileum was chiefly due to the lesions of these glands." The copper etching with which the case is illustrated is here reproduced of full size by the photo-relief process. The following is the original description of this figure: "Tab. XI, Fig. 1. Intestini ilei portionem osteodit hinc inde erosi. *a, a*, Ilei portio. *b, b, b, b*, Erosiones ejus notabiles ac profundæ. *c, c, c, c*, Juga, s. valvulæ conniventes." MORGAGNI *(loc. cit.)* has suggested that this plate represents a portion of the jejunum rather than of the ileum, basing this view upon the character of the valvulæ conniventes. But the account given by BASSIUS of the manner in which the piece was removed is not favorable to the supposition that he was mistaken. I may add that valvulæ conniventes similar to those represented in this piece sometimes extend almost to the ileo-cæcal valve, and that the character of the ulcers represented is favorable to the opinion that BASSIUS was right in calling it a piece of the ileum. I do not care to discuss the question whether the case was one of typhoid fever from the first, or whether that disease first set in during the following spring, (as the "febris lenta" of which our author speaks.) This last supposition is perhaps most probable, but as the condition of the large intestine is not recorded, the matter must remain unsettled.

§ M. A. PETIT et E. R. A. SERRES—*Traité de La Fièvre Entéro-Mésentérique*, &c., *(avec Figures Coloriées.)* Paris, 1813.

‖ MORGAGNI—*Op. cit.*, Epist. XXXI, § 13 to 17. See also p. 361–2, *supra*.

¶ *Ib.*, Epist. XXXI, § 17 to 23. WILLIS and SYDENHAM are often cited *(e. g.* by FOURNIER et VAIDY—*Dict. des Sci. Méd.*, T. X, Paris, 1814, p. 319) as the first to have recognized that dysentery might exist without ulceration, (consult the passages cited in note † to p. 347, *supra*;) but their utterances were based rather on the consideration of symptoms than on anatomical observations. I may add that SYDENHAM mentions the possibility of the "corrosion of some of the larger vessels that spread over the intestines" (which implies ulceration) to explain the intestinal hæmorrhages of certain cases, and adds that "at times the intestines, from the force of the inflammation," "have been struck with incurable gangrene," *Med. Obs.*, Sect. IV, Chap. 3, Sydenham Society's Transl., Vol. I, London, 1848. p. 167.

and hence inferred ulceration to be still more frequently absent in non-fatal cases. I have also related how Stoll,* on the basis of his own autopsies, was led to the conclusion that ulceration of the intestine was very rare in dysentery, and have alluded to the great influence which his opinions exerted. Stoll appears in these autopsies to have encountered chiefly the catarrhal forms of the disease. The severer diphtheritic variety had in the meantime been seen and described by various observers, among whom may be particularly mentioned several English military surgeons, Cleghorn, Sir John Pringle and Donald Monro,† while others seem to have encountered chiefly some of the forms of follicular disease, to be described hereafter in connection with the chronic fluxes; at least this is a reasonable interpretation to put upon some of the imperfectly described observations of Dolæus, Hewson, Wollaston and John Hunter.‡ These diversities in the phenomena recorded

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* See p. 342, *supra*. Compare also the suggestion of ACKERMANN, note †, p. 433, *supra*.

† G. CLEGHORN—*Obs. on the Epidemical Diseases in Minorca from* 1744 *to* 1749, London, 1751; I cite 4th Ed., London, 1779, p. 216—"constantly found the great guts either entirely mortified, or partly inflamed, partly mortified, the rectum being generally most affected." CLEGHORN went to Minorca as surgeon to the 22d regiment of foot. J. PRINGLE—*Obs. on the Diseases of the Army*, London, 1752, Part III, Ch. 6, p. 240—under the head "Of the Dissections," reported but four autopsies made on soldiers during his service in Flanders, remarking, "These were the only dissections made of those who died of the dysentery, or soon after it. For, tho' I wanted not opportunity of opening more bodies, yet finding these cases agree so well with the observations of those authors collected by BONETUS, I thought it unnecessary to pursue the enquiry further." In case 1 "the larger intestines" were "black and putrid, the coats præternaturally thick, and on the inside much ulcerated, especially in the rectum and lower part of the colon. The villous coat was either wholly abraded, or changed into a corrupted slimy substance, of a greenish colour; not only in the part described, but also in the cæcum and its appendix." In case 2 "The rectum was extremely putrid; and from thence the gangrene seemed to have spread to the colon, which was entirely mortified, but chiefly towards its lower end. The villous coat was partly consumed, and what remained was blackish, tender, and easily separated." In case 4 "the intestines were wholly mortified, and the stomach partly so." There were several abscesses in the liver, and "the spleen was likewise corrupted." On the other hand, in case 3, "the ligaments" of the colon "were either destroyed, or so relaxed, that the divisions of the cells were obliterated, but no part of the intestines were either mortified or inflamed. The liver was of an extraordinary bulk, reaching almost to the navel and spleen, and weighed about ten pounds. Its substance was tender, and in the posterior part next the diaphragm, was found a large abscess." DONALD MONRO—*An account of the Diseases which were most frequent in the British Military Hospitals in Germany from January*, 1761, *to the return of the Troops to England in March*, 1763, London, 1764, p. 63—found "after death in the bodies of some patients, who died of old fluxes at Bremen," that "in all of them the rectum was inflamed, and partly gangrened, especially the internal coat." Sixteen years later, reprinting this account—*Obs. on the Means of Preserving the Health of Soldiers; and of Conducting Military Hospitals, and on the Diseases incident to Soldiers*, &c., London, 1780, Vol. I, p. 326—he modified the language so that it reads: "In all of them the rectum was inflamed, and partly livid and black, and eroded, especially the internal coat." He adds that after his return from Germany he had examined the bodies "of many who died of old dysenteries," and found in all of them "a number of livid, black, gangrenous-like spots, in both the colon and the rectum, but which were most frequent in the rectum."

‡ J. DOLÆUS—*Encycl. Med. Dogmat.*, Lib. III, Cap. 5 (in Opera, Frankfort, 1703, T. I, p. 234)—made six autopsies, of which he says: "Sex enim cadavera dysentericorum à nobis secta proharunt æquè tenuia ac crassa purulentis scatuisse tuberculis, quæ inde nigra et sphacelata reperimus." In one of these cases he also found the pylorus gangrenous, ("planè sphacelatum, et corrosum.") DONALD MONRO (Vol. I, p. 332 of the second work cited in the previous note) translates this passage as follows: "In the bodies of six people who had died of the dysentery, which he opened, he found the small as well as the great guts black and sphacelated, and full of purulent tubercles;" but I feel somewhat uncertain whether DOLÆUS did not mean that the tubercles were black and sphacelated, rather than the general surface of the intestine. On the latter supposition the cases may have been examples of diphtheritic dysentery, like two others mentioned by DOLÆUS himself further on in the same chapter, of which he says: "Duos tamen exenteravi dysenteria defunctos, in quorum cadaveribus non ulcus, sed totum intestinum rectum sphacelatum inveni," (*op. cit.*, p. 235.) On the former supposition I must think the cases were probably examples of typhoid fever, like the case observed by BARTHOLINUS, cited above, as recorded by BONETUS, (Obs. 4, see note †† to p. 435, *supra*,) in which also purulent tubercles are said to have abounded in the intestines. Mr. HEWSON's cases were published in the 4th edition of PRINGLE'S *Observations* (London, 1764, p. 251) and in subsequent editions of that work. The first was a man 45 years old, who died after an illness of several weeks. The autopsy was made by Mr. HEWSON in the presence of Dr. HUCK and Sir JOHN PRINGLE. "The dissecter having cleared away the blood and mucus from the inside of the cæcum, the colon, and upper part of the rectum, made us take notice of certain excrescences of a lighter colour than the rest of the surface. They were of a roundish figure, nearly equal in their height (which was about a twelfth part of an inch) but of unequal breadth. We all agreed that we had never seen any thing so nearly resemble the small-pox, of a flat sort, at the height of the disease. These excrescences stood as thick on this tract of the intestines, as variolous pustules, when numerous, do upon the skin; but differed from them in this, that as far as we examined them they were of a firm consistence, without any cavity." These eminences were observed "only in the larger intestines." Mr. HEWSON stated that a few days before he had opened another person dead of dysentery in whom he had found similar appearances; and afterwards showed a portion of the colon, "which he had cut out of the other body and had preserved in spirits," to Sir JOHN, who remarks: "He said, that to the best of his remembrance he had taken it from the lower part of the gut. I could easily trace the resemblance between this preparation, and that which I had seen in the recent subject; though the tubercles were here more numerous, and generally higher than in the other." CHARLTON WOLLASTON'S two cases are related in a letter to Sir GEORGE BAKER—*De Catarrho et de Dysenteria Londinensi*, London, 1764, p. 43. In the first case he found evidences of inflammation in the lower part of the ileum; and the colon and rectum having been removed and cleansed with a sponge, he observed lesions which he described as follows; "in tunica villosa non leves morbi notas invenimus: tota enim referta fuit tuberculis; hinc rotundis, parvulis, rubris, inde latis fungosis, eminentibus; quæ visa sunt conflari ex tuberculis quamplurimis parvulis, in eminentium unam fungosam cõeuntibus." In the second case the small intestine presented no marks of inflammation. The transverse colon was in a sloughing condition, and presented four or five perforations by which the intestinal contents had escaped into the abdominal cavity. In the rest of the colon and the rectum tubercles were found similar to those in the first case, but smaller and less numerous. "Tubercula fungosa visa sunt; at non adeo crebra, neque adeo lata, aut alta, ac in altero cadavere." The first of these cases is illustrated by two etched plates, which will be referred to in a subsequent note. JOHN HUNTER—*Observations on the Diseases of the Army in Jamaica*, London, 1788, p. 229 *et seq.*—after citing the observations of HEWSON and WOLLASTON, declared that similar tubercles were found in all the dysenteric subjects he had examined, although he admits that the number of these cases was not considerable. He described them as follows: "There are to be seen small tubercles, like pustules, sometimes in a smaller, sometimes in a greater number; and they are to be found in different stages, so that their progress can only be collected from several observations combined. The same subject will frequently furnish, in different parts of the gut, examples of the several stages. Their progress appears to be nearly as follows: there is first a small round tubercle of a reddish colour, and not more than one tenth of an inch in diameter; it increases gradually till it be near a quarter of an inch in diameter, and becomes paler as it grows larger. In this stage

by equally sincere observers, which naturally resulted from the fact that the personal experience of each represented but a small number of more or less similar cases, became at once intelligible so soon as large numbers of post mortem examinations were made by single pathologists, whose experience soon established the fact that various pathological processes might be observed in the intestines after the death of those who during life had presented the general clinical history of dysentery.

It would require more space than can be given in this work to trace in detail the subsequent progress of investigation into the pathological anatomy of dysentery. Some of the salient points in this progress have been already sketched.* Others will be referred to in connection with the discussion of particular points in subsequent parts of this section. I shall therefore merely subjoin in a foot-note† a list of the more important essays and

there appears a small crack on the top with a slight depression, which gradually increase; and on examining the contents of the little tumour, I have generally found them to be a cheese-like substance. The pustule, for though it contain no pus, I do not know any name more expressive of its appearance, is seated under the villous coat, between that and the muscular coat. As the opening enlarges, the edges become prominent, and the base grows rough and scabrous, from which matter oozes out, that is sometimes tinged with blood. Such is the progress of one, but they are often in clusters, and become confluent, so as to form a rough unequal ulcerated surface, with an hard and thickened base. Sometimes they appear like a small eating ulcer in the gut, in which the prominence of the edges give an appearance of a loss of substance, or as if the villous coat were intirely removed." "The tubercles are most frequently found in the great guts, but they are also sometimes to be met with in the ileum; and there is an appearance of more or less of inflammation in their neighbourhood." What was the nature of the tubercles described by these writers? It would be difficult at the present time to be positive. HUNTER'S description corresponds in many respects to the tumefaction of the solitary follicles of the colon and the formation of follicular ulcers which occurs in intestinal catarrh. Perhaps, too, the cystic formations, which will be described hereafter in connection with the chronic fluxes, were observed in some of the cases. Nor can the possibility of the presence of the typhoid lesion be excluded in all these cases, and even it may have happened in others that small patches of pseudomembrane, such as sometimes occur in diphtheritic cases, may have been described as tubercles. This latter possibility was first suggested by ALEXANDER MONRO, JR.—*Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, Edinburgh, 1811, p. 119—who remarked that the "coagulable lymph," effused when "the villous coat" of the intestine is inflamed, sometimes "takes on the form of small tubercles, of a conical figure, which have been minutely described by my uncle, DR. DONALD MONRO, by SIR JOHN PRINGLE, and SIR GEORGE BAKER, as having been often found in the bodies of persons who have died from dysentery." [I note, however, that DONALD MONRO did not himself see any of these tubercles, but simply mentions the observations of this kind made by his predecessors.] Consult also the observations on this subject by DAVIS and CHISHOLM, cited in the next note.

* See p. 343 *et seq.*, *supra*.

† In the following list, which makes no pretensions to completeness, and names only important treatises, I shall not include the iconographic works, which will be discussed in a foot-note a few pages further on, or those chiefly devoted to the microscopical anatomy of the dysenteric intestine, which will be referred to when that subject is under consideration. The following are the more important works by German observers: P. F. HOPFENGÄRTNER—*Beytraege zur anat. Geschichte einiger Krankheiten*, Hufeland's Jour., Bd. VI, St. 3, 1798, S. 523—details of three autopsies of acute dysentery and four in cases of chronic flux, (chronische Bauchflüsse.) H. LICHTENSTEIN—*Über die Ruhrepidemie unter den holländischen Truppen am Vorgebirge der guten Hoffnung, in den Sommermonaten*, 1804–5, Hufeland's Jour., Bd. XXVII, St. 2, 1808, S. 48—an interesting account of an epidemic of dysentery combined with an epidemic catarrh of the respiratory organs. In all there were 637 patients and 133 deaths. A number of autopsies was made, and a sketch of the conditions observed is given. The colon was found spasmodically contracted, its inner surface ulcerated, covered with little pustules in some places, excoriated in others; peritonitis, hepatic abscesses and pneumonia were the common complications. G. F. JÄGER—*Ueber die im Jahre* 1811 *in Stuttgart herrschende Ruhr*, Rheinische Jahrb., Bd. I, Heft 1, 1819, S. 21 *et seq.* Interesting pathologico-anatomical observations on dysentery are contained in the following essays on the Napoleonic campaign of 1812 against Russia: J. ARNOLD—*Diss. de dysenteria in exercitum regium bavaricum bello Moscovitico anno* 1812 *epidemice grassata*, Landshut, 1817; SCHERER—*Hist. morborum, qui in expeditione contra Russiam anno* 1812 *facta legiones würtembergicas invaserunt, præsertim eorum, qui frigore orti sunt*, Tubingen, 1820, [in Weber's Sammlung med.-prakt., Dissertationen von Tubingen, Stück V, 1829, S. 21;] DILLENIUS—*Beob. über die Ruhr, welche in dem. russ. Feldzuge* 1812 *unter den vereinigten Armeen herrschte*, Ludwigsburg, 1819; I have not seen this essay, and cite from HAUFF—*Zur Lehre von der Ruhr*, Tubingen, 1833, S. 196—whose work contains an excellent bibliography of previous observations. Worthy of note as a careful study from nature is the paper of JOHANN WAGNER—*Einige Formen von Darmgeschwüren*: III, *Die dysenterische Darmverschwürung*, Med. Jahrb. des k. k. österreich. Staates, Bd. XI, 1832, S. 268. Special interest attaches to the often quoted works of C. ROKITANSKY—*Der dysenterische Prozess auf dem Dickdarme*, etc., Med. Jahrb. der k. k. österreich. Staates, Bd. XX, 1839, S. 81; Id., *Handbuch der Path. Anat.*, Vienna, 1841–46; also English transl. of Sydenham Society, London, 1849 to 1854; Id., *Lehrbuch der Path. Anat.*, 3te Aufl., Vienna, 1855–61. This great pathologist compared the dysenteric lesions to those which are produced in the œsophagus in consequence of swallowing corrosive acids. In his original monograph, and the first two editions of his *Handbuch*, he described "four natural degrees or forms" of the process. In the *Lehrbuch* of 1855 the description is somewhat compressed, but three degrees or "grades" are admitted, and the whole subject of dysentery is discussed as a subheading, under the caption: "3. Diphtheritische Entzündung." *(op. cit.*, Bd. III, S. 206.) The older accounts of this author have been so generally cited that I have thought it desirable to subjoin the following extract which represents his latest views: "a) In dem *leichtesten* Grade erscheint die Schleimhaut trübe, hie und da geröthet, injicirt, von einer dünnen Lage eines blassgelblichen, grauröthlichen, eiterigen Exsudates bekleidet. Zugleich bemerkt man, indem man sich dieses durch Abstreifen mit dem Skalpellrücken darstellt, dass die Schleimhaut sofort selbst in Form eines graulichen, grauröthlichen, blutigen Breies herabgeht. Hie und da finden sich kleinere oder grössere Strecken, wo die Schleimhaut augenscheinlich zu einem ganz dünnen, flerähnlichen Überzuge des submucösen Bindegewebes reducirt ist oder das letztere wirklich blossliegt. Die Solitärdrüsen sind geschwellt. Das submucöse Bindegewebe ist etwas infiltrirt, der Darm gemeinhin erweitert. Hie und da sieht man namentlich an den Falten der Schleimhaut Erscheinungen, welche die höheren Grade characterisiren. b) In den *höheren* Graden erscheint die Schleimhaut von einem schmutzig-weissen kleienartigen Stratum necrosirten Epithels, von einem dicklichen röthlich-graulichen, mit zarten weisslichen, madenartigen Flocken,—dem ausgestossenen Epithel der Drüsenschläuche,—untermischten, eiterigen Exsudate bekleidet, darunter in verschiedenem Grade geröthet und injicirt, gewulstet und dabei in demselben vorbemerkten Schmelzungszustande begriffen, morsch, hie und da abgängig. Die submucösen Gewebe, besonders das submucöse Bindegewebe, sind in hohem Grade infiltrirt, wobei das letztere an den besonders intensiv erkrankten Stellen zu Buckeln gewulstet erscheint (Gely's Hypertrophie mamelonnée du tissu sousmuqueux). Ausserdem ist die Schleimhaut hie und da, besonders im Colon desc. und Rectum, von croupösen Exsudatmembranen bekleidet, sehr häufig, besonders auf der Höhe der vorgedachten Buckel und Wülste, zu einem grünlich-braunen, blutig suffundirten Schorfe verwandelt, unter welchem das submucöse Bindegewebe ecchymosirt erscheint. An zahlreichen Stellen ist die Schleimhaut gleichsam siebförmig exedirt, wobei der Substanzverlust nur eine Schichte der Schleimhaut betrifft oder durchgreift; im letzteren Falle sind die feinen Nadelstich-, Mohnkorn-grossen Excisionen von einem schmutzig-gelben necrosirenden Schleimhautsaume umgeben. Überdiess wird man bei genauer Besichtigung der Schleimhaut Mohnkorn- bis Hirsekorngrosse Grübchen in

works containing original observations on this subject which have been published since those last mentioned, and proceed at once to give an account of the lesions observed in cases of acute dysentery during the civil war, which will be based upon the autopsies reported in Section II and the specimens preserved in the Army Medical Museum.

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verschiedener Menge gewahr, welche die Schleimhaut perforiren und in das submucöse Bindegewebe vordringen; sie rühren von der theilweisen oder völligen Destruction eben so vieler Solitärdrüsen her, welche in einem acuten Vereiterungsprocesse untergingen (S. Fig. 23). Das Colon ist contrahirt, in seinen Häuten gewulstet, starr, später erweitert, und enthält nebst Gas das oben bemerkte röthlich-grauliche, dickliche, eiterige, oder ein schmutzig-braunes, jauchiges, stinkendes, flockig-krümliches Fluidum. Die Lymphdrüsen in den Mesocolis sind angeschwollen, blutreich, gehockert. *c)* In dem *höchsten* Grade ist die Schleimhaut in grossen zusammenhängenden Strecken zu einem grünlich-braunen, festsitzenden, oder schwarzen, morschen, losen Schorfe verwandelt, welcher nicht selten in Form röhriger Lappen ausgeführt wird. Das submucöse Bindegewebe ist seros infiltrirt, blass, von schwarzen, eine pulverige, schlammige Blutmasse enthaltenden Gefässramificationen durchsetzt, späterhin eiterig infiltrirt, morsch, zerreisslich, häufig von kleineren und grösseren Heerden durchsetzt, in welchen es von der Schleimhaut her zu einer schwarzen zottigen Pulpe necrosirt.—Hiebei ist der Darm erweitert, häufig collabirt und enthält schwarzbraune, kaffeesatzähnliche, sphacelös riechende Materien, die Mesenterialvenen führen nicht selten vom Darme her eine schwarze, schlammige, necrosirende Blutmasse." Worthy of note are also the observations of FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift, Bd. XXIV, 1849, S. 125—see p. 405, *supra*. W. GRIESINGER—*Beob. über die Krankheiten von Egypten*, Archiv für Physiologische Heilk., 1854, S. 528. O. HEUBNER—*Beitraege zur internen Kriegsmedicin*, Archiv der Heilk., 1871, S. 413, Dysenterie. FRANZ SEITZ—*Aerztliche Beobachtungen aus dem deutsch-französischen Kriege im Jahre 1870-71 besonders über die herrschende Ruhr*, Aerztliches Intelligenz-Blatt, December, 1871, S. 657 and 649, 1872, S. 10, 26, 43, 58, 68 and 82. Among the French works I may particularly name the following: F. J. V. BROUSSAIS—*Hist. des Phlegmasies*, Paris, 1808; I cite the 3me Éd., Paris, 1822, T. II. p. 517 *et seq*—who, however, appears chiefly to have observed chronic catarrhal cases. In these he found the mucous membrane thickened, and presenting little ulcers which he compared to chancres (ulcères vénériéns) and believed to originate in the solitary glands. "L'examen attentif de ceux de ces ulcères qui ne sont encore que commençans m'a fait croire qu'ils prenaient naissance dans les cryptes ou glandules qui fournissent la mucosité." *Op. cit.*, T. III, p. 78. A. TROUSSEAU et H. PARMENTIER—*Mém. sur une épidémie de dysenterie qui a régné dans le département d'Indre et Loire en* 1826, Arch. Gén. de Méd., T. XIII, 1827, p. 377, and T. XIV, p. 33. J. GUÉRETIN—*Mém. sur la dysenterie épidémique de Maine-et-Loire en* 1831, Arch. Gén. de Méd., T. VII, 1835, p. 51. S. THOMAS (de Tours)—*Recherches sur la dysenterie*, same Jour., T. VII, p. 455, T. VIII, p. 157, T. IX. p. 19. GÉLY—*Essai sur les altérations anatomiques qui constituent spécialement l'état dysentérique*, Journal de la Section de Médecine de la Soc. Académ. de la Loire-Inférieure, T. XIV, 1838, p. 193. MASSELOT et FOLLET—*Mém. sur l'épidémie dysentérique qui a régné a Versailles dans les mois d'Aout, Septembre et Octobre*, 1842, Arch. Gén. de Méd., T. I, 1843, p. 434, T. II, pp. 51 and 147. CATIELOUP—*Recherches sur la Dysenterie du Nord de l'Afrique*, Paris, 1851. GUSTAVE SACHER—*De la dysenterie*, Paris Thesis, No. 283, 1853, a paper important because its pathological descriptions are avowedly borrowed from an unpublished essay of CHARCOT, (p. 10.) The following are among the more important English works: THOMAS CAWLEY—*An account of the dysentery as it appeared among his Majesty's troops in Jamaica during the late war; with dissections explaining the proximate cause of that disease*, &c., The London Med. Jour., Vol. VII, 1786, p. 337—reports fourteen autopsies. He takes the ground that the "prevalence and fatality of the dysentery were caused by the scurvy," p. 341. J. B. DAVIS—*A Scientific and Popular View of the Fever of Walcheren*, &c., London, 1810, p. 155 *et seq.*—reports forty-two autopsies on subjects dead at Ipswich of the Walcheren diseases, among whom was a number of dysenteries. He found in the slighter cases "certain marks of vascular derangement." In those cases which followed the fever "the coats of the large intestines were preternaturally thick and hard," and in places "there were small eminences of the size of a pin's head or eminences of the magnitude of a grain of wheat, cut in halves, rougher at their apex, than their sides and bases; or small round bodies with an ulcer at their point, or little ragged ulcers excavated in the middle, resembling chancres; or one large, or a succession of small ulcers spreading wide upon and deep into the coats of the intestine." He speaks of these eminences elsewhere as "tubercles," and says that they "had their origin underneath the villous coat of the intestine." The gut was generally inflamed around the ulcers, and, "in advanced stages of the disease, gangrenous." Moreover, "the ileum and jejunum were frequently interspersed with tubercles, inflamed, and ulcerated in different parts," pp. 190–2. Undoubtedly in some of these cases the lesions of typhoid fever existed. GEORGE BALLINGALL—*Pract. Obs. on Fever, Dysentery, and Liver Complaints*, &c., Edinburgh, 1818—tabulates thirty-five autopsies with the remark: "I have dissected not less than a hundred subjects dead of this disease, and have witnessed the dissection of many more," p. 58. He observed inflammation, abrasion, ulceration, and in a few instances "the tuberculated appearance which has been so aptly compared to small pox." COLIN CHISHOLM—*A Manual of the Climate and Diseases of Tropical Countries*, &c., London, 1822, p. 55—says that in the dysentery he saw in the West Indies the large intestines were always in a state of inflammation. "The effects of this state are gangrenous blotches, but oftener tubercular excrescences on the internal surface of the large intestines.—These excrescences are the result of exudation of lymph. The rectum is more especially the seat of these—the whole length of this intestine being often covered with a dark bloody slime, and a number of excrescences which resemble very much the pustules of small-pox of a flat kind, at the height of the disease." J. CHEYNE—*Med. report of the Whitworth Hospital, House of Industry; containing an account of dysentery, as it appeared in the latter end of* 1818, Dublin Hospl. Reports, Vol. III, 1822, p. 1—thirty autopsies. O'BRIEN—*Observations on the Acute and Chronic Dysentery of Ireland*, Dublin, 1822, (see p. 343, *supra.*) JOHN ABERCROMBIE—*Path. and Pract. Researches on the Diseases of the Stomach, the Intestinal Canal*, &c., Edinburgh, 1828, p. 296 *et seq.* His descriptions, like those of O'BRIEN, represent distinctly both the catarrhal and diphtheritic forms. On p. 211 he gives a good description of follicular ulcers, and remarks, "the cases in which these occur are generally chronic." P. M. LATHAM—*An Account of the Disease lately prevalent at the General Penitentiary*, London, 1825. This "disease' at Milbank is described as "Sea Scurvy," conjoined with diarrhœa or dysentery, p. 5. In those who died of the fluxes the principal lesions observed in the intestinal canal were "ecchymosis, congestion of the small blood vessels, and ulceration," p. 44. Sometimes the ulcers "did not exceed in diameter the size of a pea, and were of a circular shape. Sometimes they were large and irregular, occupying in diameter a space of one or two inches," p. 47. E. A. PARKES—*Remarks on the Dysentery and Hepatitis of India*, London, 1846. This observer appears to have encountered a preponderance of catarrhal cases, and arrived at the conclusion that inflammation and ulceration of the solitary glands of the colon "are the earliest morbid changes in dysentery," p. 6. WM. BALY—*Gulstonian Lectures*, London Med. Gaz., Vol. IV, 1847, p. 441 *et seq.*—on the other hand, encountered both the catarrhal and diphtheritic forms. In his 1st degree, he describes follicular enlargement and sloughing (not ulceration) of the apices of the swollen follicles. In his 2d degree, in some cases, "the glands lose their vitality, and are converted into small sloughs, but the mucous membrane in which they are imbedded is inflamed and thickened, and is likewise altered on its surface." In other cases "the solitary glands have not apparently suffered more nor perished sooner than the surrounding mucous membrane; consequently no small round ulcers have been formed. But the entire mucous membrane, in larger or smaller tracts, where the inflammation has reached a certain height, has fallen into the state of gangrene, and these gangrenous portions, which are generally seated on the prominent folds of the membrane, subsequently becoming detached, leave larger ulcer-like excavations." Lastly, in his 3d, or most severe degree, "the inflammation affecting a large extent of the mucous membrane reduces it with extreme rapidity to the state of sphacelus." JOHN MACPHERSON—*On Bengal Dysentery*, Calcutta, 1850—tabulates 160 autopsies of acute and 55 of chronic dysentery. R. D. LYONS—*Report on the Pathology of the Diseases of the Army in the East*, London, 1853—tabulates 51 autopsies of subjects dead during the Crimean war, and classifies the dysenteric lesion as (a) exudative, (b) pustular dysentery, or follicular colitis. (This is a most conscientious work, and worthy of all praise.) CHARLES MOREHEAD—*Clinical Researches on Disease in India*, 2d Ed., London, 1860, p. 238 *et seq.*—gives the details of a considerable number of interesting autopsies; the same remark applies to the paper of S. G. CHUCKERBUTTY—*Cases illustrative of the pathology of dysentery, with remarks*, Indian Annals of Med. Sci., No. XIX, 1865, p. 90 *et seq.*—which contains the details of 39 autopsies. T. S. CLOUSTON—*Sewage exhalations the cause of dysentery*, Med. Times and Gazette, June, 1865, pp. 567 and 597—gives a description of the pathological anatomy based on 16 autopsies.

The lesions found in the intestinal canal in these cases may be briefly summarized as follows: either the mucous membrane of the large intestine presented the anatomical characteristics of simple inflammation without ulceration, or follicular ulceration existed, or some form of pseudomembranous inflammation was present. Lesions belonging to the first two categories occurred in simple inflammatory dysentery; those belonging to the last were characteristic of the diphtheritic variety of the disease. In either case the inflammatory process sometimes extended with more or less severity to the small intestine.

*Simple inflammation without ulceration.*—A condition of simple catarrhal inflammation involving the mucous membrane of the large intestine alone, or extending for a variable distance into the small intestine, was, I presume, much more frequently the only intestinal lesion existing in acute dysentery than would be inferred from the comparative rarity with which this accident only was found in the post mortem examination of fatal cases. Such cases are very apt to terminate in recovery, and probably seldom prove fatal unless the health of the patient is already broken down by some chronic cachexia, or he is carried off by some intercurrent disease. Under the last named circumstances especially, the intestinal lesion found may be very slight in its character, as, for example, in case 499, a lad of 19 years of age suffering from acute dysentery, who shortly after his admission to general hospital was attacked by pneumonia, and died on the eleventh day after admission. Gray hepatization of the lower lobe of his right lung was found after death, but "the intestines presented no evidences of serious disease."*

The description already offered of the inflammatory process in the intestinal canal, in that portion of this section which treats of the post mortem appearances in acute diarrhœa,† so precisely corresponds to what was observed in simple catarrhal dysentery when the inflammatory process did not go on to ulceration, that a detailed account of the pathological conditions observable in these cases would lead to needless repetition. The reader is therefore referred to that portion of the section for particulars. The reasons for the development, in these cases of intestinal catarrh, of the characteristic clinical features of dysentery rather than of diarrhœa are to be sought in the more acute character of the process, its greater severity, its extension further down the large intestine so as to involve the peripheral nerves of the expulsive apparatus, the greater sensibility of the individual attacked, or in the simultaneous action of two or more of these circumstances.

The number of autopsies recorded in Section III of cases of recognized dysentery in which these comparatively slight lesions were observed is quite small, viz: Cases 121, 185, 562, 590, 780, 783 and 805; but I doubt not that others, especially of those enumerated on page 310, were really of this nature. The history of many of those cases is so imperfect that it is impossible to be sure whether the patients died of diarrhœa or of catarrhal dysentery; frequently the only testimony is the very fallible evidence of the diagnosis recorded on the hospital register. Of the cases just enumerated, case 185 was one of Bright's disease of the kidneys; five days before death uræmic convulsions occurred; next day the patient was attacked by acute dysentery, which was the immediate cause of death, and was probably

* Page 197, *supra*.

† That the intestines might be found free from recognizable disease in the cadavers of subjects dead of dysentery, and other severe forms of flux, was especially remarked by G. C. CONRADI—*Handbuch der Path. Anat.*, Hannover, 1796, S. 148—who explains this circumstance by the remark that the local lesions are the consequence, not the cause, of the disease, and that many patients die of the fever or from other causes before the disease has reached the stage in which the local processes become evident. So also HUFELAND—*Bemerk. über die im Herbst* 1795 *in und bey Jena ausgebrochne Ruhrepidemie, und den ausgezeichneten Nutzen der Nux Vomica in derselben*, Hufeland's Jour., Bd. I, St. 1, 1795, S. 87—reported that during the Jena epidemic of 1795 he found no serious lesions of the intestinal mucous membrane in those cases in which death took place from exhaustion during the first violence of the attack, but simply observed that the colon was spasmodically contracted.

induced by the elimination of urea from the intestinal mucous membrane. The colon and rectum were greatly "inflamed and thickened." In case 590 there is a history of acute dysentery, but the patient died of intercurrent pneumonia. "A considerable portion of both lungs was hepatized," but the only lesion observed in the intestinal canal was that "the mucous membrane of the rectum was inflamed." In four of the other cases acute dysentery alone appears to have been the cause of death; in a fifth, case 805, it was complicated, according to the report, by "remittent fever." The lesions observed in the intestinal mucous membrane in these cases were as follows: Case 121, the mucous membrane of the ileum near the ileo-cæcal valve was highly congested, in places appeared to be "denuded of epithelium," that of the colon was thickened and congested; case 562, "both large and small intestine were inflamed throughout, especially from the middle of the ileum downward, but no marked ulceration was observed;" case 780, "the mucous membrane of the lower portion of the ileum was red and thickened," that of the colon "dark purple and thickened," a condition which "diminished in degree towards the sigmoid flexure, where the mucous membrane again became healthy;" case 783, "the small intestine was normal, the colon was highly inflamed throughout the greater portion of its length;" case 805, the mucous membrane of the "small intestine was inflamed, thickened and softened in places; that of the large intestine was very much inflamed and thickened."

*Follicular ulceration.*—But acute dysentery does not usually prove fatal until more serious lesions than these have been developed in the intestinal mucous membrane. The inflammation in fatal cases is often so intense as to favor the early development of ulceration, commencing especially in the solitary follicles, though often affecting also other portions of the mucous membrane. The best modern authorities recognize these lesions as of frequent occurrence in simple catarrhal dysentery, and I have no doubts as to the accuracy of this opinion. All that I have been able to observe myself, or collect of the observations of others, during the civil war, has however impressed me with the belief that the number of cases of fatal acute dysentery in which follicular ulceration of the large intestine was the characteristic lesion, was quite small when compared with those in which the diphtheritic process existed in some stage of its progress.

Follicular ulceration, attended by the well known concomitant thickening of the submucosa, was indeed an exceedingly frequent lesion in the bodies of those who died of flux but when a complete history of the case could be obtained, it usually proved that the patient had suffered from looseness of the bowels, either continuously or at intervals, for several months. Sometimes the illness began as an acute catarrhal dysentery and passed gradually into a chronic flux of variable duration; sometimes it commenced as acute diarrhœa which persisted with various fluctuations often for a long time, and not unfrequently assumed the dysenteric form only during the last few days or weeks of life. Where the history is incomplete these cases were almost always recorded as chronic diarrhœa. I have, therefore, been led to the conclusion that during our civil war, at least, follicular ulceration was rather one of the common and characteristic lesions of chronic flux than of acute dysentery, and for this reason I propose to postpone its detailed description to a subsequent portion of this section in which I shall treat of the lesions found in the chronic fluxes.

Nevertheless, follicular ulceration stands closely related to acute dysentery in several ways. Thus, in a considerable number of cases, after a chronic flux had persisted with varying severity for a longer or shorter time, intense symptoms of acute dysentery set in,

tormina, tenesmus and the characteristic discharges of diphtheritic dysentery, and death soon followed. On the autopsy, in such cases, thickening of the submucosa and follicular ulceration were very generally found in the colon; but between the follicular ulcers the mucous membrane was the seat of a more or less intense diphtheritic process, usually indeed still in its earlier stages, because in these cases, which are to be interpreted as acute diphtheritic dysentery supervening upon a chronic ulcerative catarrh of the colon, the development of the diphtheritic process generally proves speedily fatal.

The lesions found in cases of this class will be most conveniently discussed after I shall have treated in detail of follicular ulceration, and I shall postpone their consideration to that place. Meanwhile it must be borne in mind that soldiers suffering under mild chronic fluxes not unfrequently persist in carrying the musket for a considerable time; medical aid is afforded by the regimental surgeon; the flux is arrested for a while, and again bursts out afresh; months often elapse before the patient finally is sent to general hospital. Now when, in such cases, acute diphtheritic dysentery supervenes, the patient at once breaks down and is sent to hospital, where he presents the characteristic phenomena of the consecutive disease and his previous history is too apt to be overlooked. Even where the diphtheritic process is not developed toward the close, chronic ulcerative catarrh of the colon in its later stages often gives rise to symptoms resembling those of the advanced stages of acute dysentery, so that if the case is only seen at this period it is easy to underestimate the significance of the earlier stages and the actual duration of the disease. I am quite sure that a portion at least of the instances, in which follicular ulceration of the colon has been found after death from dysentery by the European observers, also belong really to one or the other of the two categories just indicated; certainly the majority of the cases of follicular ulceration of the colon which are figured in the pathological plates are avowedly from chronic cases.*

I do not doubt that under other circumstances follicular ulceration of the colon may be more frequently found after death from acute dysentery than it was during the civil war; and even during the civil war I do not doubt that in cases of catarrhal dysentery follicular ulceration was often developed at a very early period, or that such cases were still more apt to prove fatal than those of simple inflammation without ulceration. It is reasonable to suppose that the intense forms of catarrhal inflammation of the intestinal mucous membrane, which especially produce the symptoms of dysentery, would develop follicular ulceration and thickening of the submucosa much earlier than the less severe, more subacute process, which more generally gives rise to symptoms of diarrhœa rather than of dysentery. While, therefore, I point out that the number of fatal cases with a clear history of acute dysentery, in which follicular ulceration was the principal lesion of the colon, found on the autopsy was not large, I am far from supposing that this condition was not of frequent occurrence both in the cases that recovered and still more frequently in those which, commencing as acute catarrhal dysentery, subsequently assumed a chronic form. In the majority of the fatal cases of acute dysentery in which autopsies were made during the war, however, diphtheritic inflammation of the large intestine was undoubtedly the characteristic morbid process.

* See note to p. 444, *infra*. The cases observed by HEUBNER—*Beiträge zur internen Kriegsmedicin*, Archiv der Heilkunde, Jahrg. XII, 1871, S. 412—in the reserve hospital at Leipsic during the Franco-German war, appeared to have been of the character described in the text. There were but five deaths, and the author himself describes three of these as chronic cases. His statement that none of these cases presented evidences of the diphtheritic process, but manifested simply suppurative inflammation (eitrige Entzündung) of the intestine, while no doubt strictly accurate, can hardly, therefore, from the small number of observations, be of any value in indicating the prevalent form of dysentery even in the Franco-German war.

*Diphtheritic inflammation.*—This form of inflammation was usually found coexisting with more or less highly developed catarrhal inflammation of other portions of the intestinal tract, and in the acute cases, especially, with a catarrhal inflammation which had not yet resulted in the formation of follicular ulcers. The catarrhal inflammation, manifesting itself by all the characters described above,* was sometimes limited to the colon, but more frequently involved also the lower part of the ileum, or extended, usually in the form of detached inflammatory patches of variable dimensions, high up the small intestine. The diphtheritic process, which in most cases must be regarded as having supervened upon the previously developed catarrhal inflammation, varied greatly both as to its extent, the firmness or tenacity of the exuded material, and the stage of the process in which death occurred. Sometimes the exudation was limited to the descending colon and rectum, or to the latter alone; sometimes it involved other portions of the large intestine or the whole of it; sometimes it extended for a variable distance into the small intestine; sometimes the exudation, or at least some part of it, was quite superficial, lying as a separable layer upon the surface of the mucous membrane, involving only its superficial epithelium and filling the interiors of the follicles of Lieberkühn. Usually, however, in a portion at least of the affected area, the adenoid tissue of the mucosa, and often a part or even the whole of the submucosa, were also involved.

The exudation consists essentially of a fibrin-like substance, which under the microscope presents usually a finely granular or indistinctly fibrillated appearance; which coagulates with various degrees of firmness and entangles in the coagulum a variable number of migrated white corpuscles. The parts embraced in the coagulated exudation promptly lose their vitality and slough, the depth of the slough being coequal with the depth of the previous exudation. The extent to which sloughing is found to have occurred in any particular case depends partly upon the original extent of the diphtheritic process, partly upon the period that has elapsed between its development and the death of the patient. The exudation and the resulting sloughs were primarily whitish or yellowish in color, but they were often reddened by hæmorrhage, or colored greenish or blackish by subsequent changes in the transuded blood. Often, also, they were superficially stained greenish-brown or blackish by the intestinal contents. All the diverse appearances observed in the diphtheritic cases resulted from mere variations in the manner in which the several processes thus briefly enumerated were combined. Here may be mentioned the fact pointed out by Virchow, that the portions of the mucous membrane involved in the diphtheritic layer no longer secrete,† at least until the sloughs begin to separate, when a certain amount of pus is formed; so that the mucus and muco-pus of the dysenteric discharges proceed chiefly from those parts of the mucous membrane affected by catarrhal inflammation.

The chromo-plate which faces page 442 illustrates one of the forms in which the diphtheritic process manifests itself in acute dysentery of an intense character. The patient was admitted to Douglas Hospital, Washington, D. C., during September, 1864, from the army of the Potomac, suffering with acute dysentery, and expired shortly after admission. On the autopsy the whole colon was found in a condition similar to that exhibited by the specimen, and patches of redness existed throughout the ileum. No other abnormity of importance was observed. The specimen represented by the plate was brought to the

* *Supra*, p. 296 *et seq.*

† *Kriegstyphus u. Ruhr*, Virchow's Archiv, Bd. LII, S. 26: "Die diphtheritischen Stellen als solche sondern gar nichts ab."

Army Medical Museum immediately after the autopsy, by Assistant Surgeon Wm. Thomson, U. S. A., and a water-color drawing made by Mr. Hermann Faber. It is a portion of the descending colon, spread out to exhibit its mucous surface. This is irregularly plastered over with a thick curd-like pseudomembrane of a greenish-yellow color, which, in numerous small patches, is either so thin as to be transparent or is altogether absent, permitting the livid red of the inflamed mucous membrane to appear on the surface. Perpendicular sections showed the mucosa and submucosa to be thickened and infiltrated with an exudation resembling that upon the surface. The specimen is preserved in the Army Medical Museum, [No. 360, Medical Section.] This plate, and the following ones representing various stages of the diphtheritic process in the intestine, should be compared with the plates illustrative of the pathological anatomy of dysentery published by the museum at Chatham, by Annesley, Cruveilhier, Albers, Gluge* and others.

Another form in which the diphtheritic process manifests itself is well displayed in the photo-plate facing this page. This is a reproduction of a nature-size photograph of No.

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* *Anat. Drawings from Preparations in the Museum of the Army Medical Department at Chatham*, Fasc. I, London, 1824—Plate IX, Fig. 1, and Fasc. II, London, 1831—Plate VIII, Figs. 1, 2, 4 and 5. These figures are executed in the coarse lithography of the time at which they appeared, and are uncolored; it is therefore difficult, if not impossible, to determine the lesions represented. The cæcum, from a case of acute dysentery, represented in Plate VIII, Fig. 2, is undoubtedly a specimen of diphtheritic sloughing, and the dependent sloughs are pretty well indicated. I judge the perforations in Figs. 4 and 5 of the same plate, and the ulcerations represented in Fig. 1, Plate VIII, and Fig. 1, Plate IX. to be also results of the diphtheritic process, but cannot feel positive on account of the imperfect character of the representation. JAMES ANNESLEY—*Diseases of India*, London, 1828. The costly colored plates of this splendid work cannot always be satisfactorily interpreted. Those that represent hepatic abscesses, as well as those which represent displacements, constrictions and dilatations of the colon in dysentery, or general and partial peritonitis, are quite intelligible; but those that represent the mucous surface of the intestine are so deficient in detail that it is difficult to decide what pathological conditions existed in the original specimens. Fig. 1, Plate 33 and Plate 35 certainly represent the diphtheritic process. I judge Plate 32 to represent acute catarrhal dysentery with small follicular ulcers, and Plate 38 to represent a characteristic thickened colon with follicular ulcers, from a case of chronic flux. The other pictures of morbid conditions of the mucous surface in dysentery, viz: Plate 21, Fig. 3; Plate 25, Fig. 3; Plate 28, Figs. 3 and 4; Plate 31, Fig. 2; Plate 34, Figs. 1 and 2; Plate 36, Fig. 2; Plate 39; and Plate 40, Figs. 1 and 2, I confess myself unable to interpret on account of the peculiar manner in which they are executed. J. CRUVEILHIER—*Anat. Path. du Corps Humain*, 1829–42. In this great work several varieties of the diphtheritic process are very satisfactorily represented by three colored lithographs, viz: Livraison 31, Plate 3, which represents diphtheritic eschars in patches on the mucous surface of the colon, from a case described by the author as "entée par plaques gangréneuses;" Liv. 38, Plate 3, Figs. 1 and 2, represent portions of colon thinly coated with pseudomembrane, from cases of acute dysentery, and Liv. 40, Plate 5, is a strikingly effective though somewhat rough representation of the commencement of sloughing in diphtheritic dysentery, from a soldier dead of the acute form of that disease. Follicular ulceration of the colon is not figured in this work. J. F. H. ALBERS—*Atlas der Path. Anat.*, Bonn, 1832–62. This work is not equal to that of CRUVEILHIER in the execution of its lithographic plates. Tab. 17 and 18, Abth. IV. contain four figures, two of them colored, which are readily recognized as representations of the diphtheritic process. G. GLUGE—*Atlas der Path. Anat.*, Jena, Bd. II, 1850. Lief. 18, *Die Dysenterie*, Taf. 1 and 2, are colored lithographs which are recognizable as representations of the diphtheritic process, but which, in execution, are inferior even to those of ALBERS. In Taf. 3, which is devoted chiefly to the microscopical appearances, Figure 4 is a rather rude representation of follicular ulceration. The account of the case given in the text describes it as one of "ulcerous dysentery," but does not indicate how long the patient had been sick. Besides the foregoing works, I may mention the following as containing representations of the lesions in dysentery: G. BAKER—*De catarrho et de dysenteria Londinensi*, &c., London, 1764—gives two copperplates: Tab. I representing a portion of the rectum, and Tab. II a portion of the colon, from a sailor who had suffered from diarrhœa and dysentery for seven months. The autopsies were made by C. WOLLASTON, who describes both as covered with "tubercles," some round and small, others broad and fungus-like. The plates, which are but rudely executed, nevertheless give probability to the opinion of ALEXANDER MONRO, that these were really effusions of coagulable lymph—see note to p. 437, *supra*—if so, these plates are the earliest representations of diphtheritic dysentery with which I am acquainted, and represent a diphtheritic process which supervened after the patient had suffered for some time from catarrhal diarrhœa, as indeed is indicated by the history of the case; WM. STARK—*Spec. med. inaug. septem historias et dissectiones dysentericorum exhibens*, &c., Leyden, 1766—published two etchings on copper, admirably executed, which represent some of the lesions characteristic of chronic fluxes. I shall refer again to these excellent plates in connection with cysts and follicular ulceration of the colon, and will only remark here that but one of the seven histories analyzed in this dissertation was a case of acute dysentery, viz: Hist. VI, and that the lesions of this case are not represented in the plates; MATT. BAILLIE—*The Morbid Anatomy of some of the most important parts of the Human Body*, 2d Edit., London, 1812, Fasc. IV, Plate II, Fig. 4, and Plate III, Figs. 1, 2 and 3. This work contains four figures, (copperplates, uncolored,) of which the first cited represents follicular ulceration of the colon; no history. The figures on Plate III, we are told, are intended "to illustrate the morbid appearances observable in the great intestines of persons who have been carried off by that fatal species of dysentery which too often arises in camps." Two of these figures are possibly intended to represent the diphtheritic process. In Fig. 3 the mucous surface appears to be healthy. I must say, however, that these laboriously executed plates do not indicate the pathological details of the specimens in such a manner as to justify a positive opinion. J. HOPE—*Principles and Illustrations of Morbid Anatomy*, London, 1834—Figs. 125 and 126, both said to represent gangrene of the mucous membrane of the colon; 126 is said to have been taken from a case of "acute dysentery of extreme severity and rapidity." ROBERT CARSWELL—*Illustrations of the Elementary Forms of Disease*, London, 1838—gives no illustrations of the diphtheritic process, but two colored lithographs representing follicular ulceration, viz: Plate II, Fig. 4, in the section on Softening, and Plate IV, Fig. 3, in the section on Melanoma. The latter was a chronic case; whether the former was or was not, is not stated. In the same way in the splendid work of H. LEBERT—*Traité d'Anat. Path.*, Paris, 1857–61—4 vols. folio, illustrated by copperplates colored by hand, the diphtheritic process is not figured. There are, however, on Plates 116, 117 and 118 six figures of follicular ulceration of the colon, four of which are from chronic cases; in the other two the duration is not specified. In a general way, then, the plates representing the lesions of dysentery hitherto published may be divided into three groups: (1) those which evidently represent the diphtheritic process; (2) those which represent follicular ulceration of the colon; and (3) those which are so imperfectly executed that it is now impossible to determine just what the nature of the process represented really was. From the latter group of course no valuable inferences can be drawn, and even in the case of the two former groups several of the plates are unaccompanied by definite histories; but so far as the facts are given with regard to these groups, the first always represents the lesions of acute dysentery and the second those of a chronic flux, the only exception being ANNESLEY'S Plate 32, described above. This result certainly affords additional support to the opinion I have formed on the basis of my own observations. See p. 442, *supra*.

*Heliotype.* *James R Osgood & Co., Boston.*

TRANSVERSE COLON WITH PSEUDO MEMBRANOUS PATCHES.

No. 124. MEDICAL SECTION.

124, Medical Section. The following history of the case was furnished by Surgeon George F. French, U. S. V., hospital No. 3, Vicksburg, Miss.*

CASE 892.—Private Benjamin F. Lemon, company G, 93d Indiana volunteers; age 20; admitted October 12, 1863. Chronic diarrhœa. Says he had lung fever five years ago, and that whenever he takes cold he has a very severe pain in the left side after a full inspiration; has been subject to a dry cough for some time. Nevertheless he enlisted in August, 1862, and is reported on the rolls of his company as present for duty until October 10, 1863. He states, however, that August 1, 1863, he had a mild attack of diarrhœa, which in about two weeks gradually changed into dysentery, with tenesmus and bloody stools. When the dysentery was at its height the stools varied in number from twenty to forty, soon diminishing, however, to eight or ten daily; in appearance they were sometimes gelatinous, sometimes mucous and white. About the middle of October his appetite, which up to that time had been excellent, failed. November 1st: Pulse 81; tongue pale in the centre, red on the edges, with slight white fur at its base; stools small and variably white, flocculent, gelatinous or shreddy. Treatment: He never had any injections until he entered this hospital, and says he had no other diet than the ordinary ration. After October 10th he was treated with opiate and turpentine injections; being very anæmic, he was also put upon tincture of the chloride of iron. Tarragona wine and stimulants were given freely. His diet consisted of boiled milk, rice, farina and occasionally rare broiled beef. Died November 21st. *Autopsy* ten hours after death: There were strong pleuritic adhesions investing the whole anterior surface of the left lung. The heart was normal. The liver was normal. The spleen was about the size of a kidney, and had an abnormal congenital fissure in its upper end. The stomach was normal. There were a few spots and tracts of inflammation with moderate softening here and there in the small intestine. About the same degree of inflammation and softening in the cæcum, but no ulcerations in the cæcum or ascending colon. The transverse colon was dark and livid; the descending colon and rectum were bright red. For about sixteen inches above the anus the bowel was almost bared of its mucous coat by ulceration, [sloughing?] and there was only a slight glaze over the muscular coat, which presented a whitish appearance. At the lower end of the rectum livid, yellowish-gray, warty granulations adhered to the surface. The upper portion of the rectum was slightly roughened with a superficial exudation; still higher up some of the ulcerations are ragged, others round or oval, all limited to the mucous coat, and some of them filled with a dirty white adherent lymph, causing them to appear raised above the surface. [Nos. 124 and 125, Medical Section, Army Medical Museum, are from this case. The ulcers "still higher up" than the upper part of the rectum, filled with lymph so as "to appear raised above the surface," were the patches of pseudomembrane described below.]

No. 124, Medical Section, the specimen represented in the plate, is a portion of the transverse colon from this case. The upper part of the specimen displays the smooth unbroken surface of the mucous membrane, and this surface appears in places as far as to the bottom of the piece; but commencing in the upper third and increasing in frequency and size towards the lower part of the piece, its surface is occupied with patches of a pretty firm curd-like pseudomembrane. The smallest of these patches is not larger than a pin's head, the largest, in the lower part of the piece, covers an irregular area several inches in length. No. 125, Medical Section, is a portion of the descending colon from the same case. It is even more continuously plastered with pseudomembrane than the lower part of No. 124. In places where the pseudomembrane is very thin or absent a few minute follicular ulcers can be recognized. From the account given by Surgeon French, it would appear that still nearer the rectum a large part of the mucous membrane had been destroyed by the sloughing of the diphtheritic exudation.

This case appears to have been one of catarrhal diarrhœa running into catarrhal dysentery about the middle of August, and subsequently subsiding into a chronic flux, with eight or ten stools a day. Diphtheritic dysentery probably supervened after the first of November, perhaps not long before death. On this point the history is imperfect; the diphtheritic process did not extend above the transverse colon, and the diphtheritic sloughing was limited to the rectum. The catarrhal inflammation which preceded the diphtheritic exudation was most intense in the descending colon and rectum, for no follicular ulcers were found in the transverse colon or higher up. The diphtheritic inflammation was evidently extending at the time of death, and the plate, which represents its superior limit, may therefore be regarded as representing an early stage of the process.

The two foregoing plates represent examples of that variety of the diphtheritic process in which a firm exudation accumulates on the surface of the mucous membrane, involving

* See p. 254, *supra*, for other cases observed by Surgeon French.

also generally that membrane itself and a portion of the submucous connective tissue, before sloughing takes place; but in other cases the exudation was less rich in fibrin, or the fibrin itself was less coagulable, so that the mucous membrane, together with more or less of the submucous layer, speedily sloughed, having first become more or less swollen by an infiltration of feebly coagulating fibrin, the portions of which, that reached the mucous surface, were so readily swept away by the intestinal discharges that often they did not adhere to the surface at all, or adhered in but limited areas. Representations of this form of the diphtheritic process will be found in parts of the plates reproducing Nos. 970 and 1060, Medical Section, and between these extreme cases in the one direction and those of the firm, tough pseudomembrane already described in the other, every possible transition form existed.

The sloughing which attacks the parts entangled in the diphtheritic exudation may be a gradual process, in which the necrosed tissue separates in little shreds; or portions of the surface of considerable size may be thrown off. The plate facing this page, which is a reproduction of a nature-size photograph of No. 703, Medical Section, illustrates one variety of the former of these processes. The following is a brief history of the case:

CASE 893.—Private Wm. Brooks, company H, 2d United States colored troops; enlisted March 11, 1865. From this time till December 31, 1865, he appears on the muster-rolls of his company as present for duty, except during September and October, when he was on detached service. With the exception of these two months he served in Florida, and was under treatment by the regimental surgeon in June for constipation, and in July and August for jaundice. About the middle of December he was taken sick with dysentery, and in January was sent north for treatment. He was admitted to Harewood hospital, Washington, D. C., January 12, 1866, having at that time been sick four weeks He had the usual symptoms of acute dysentery, and died January 20th. Was not much emaciated at the time of death. The treatment consisted of astringents, opiates and supporting measures. *Autopsy:* The small intestine appeared to be quite normal. The colon was thickened and ulcerated in many places throughout. The rectum as in the specimen. The condition of the other organs is not recorded.—Surgeon R. B. Bontecou, U. S. V. [No. 703, Medical Section, Army Medical Museum, is from this case.]

The specimen represented by the plate is from the rectum of this patient. In the upper part of the piece the mucous and submucous tissues are swollen and infiltrated; the surface is irregularly coated with tough pseudomembrane. In the lower part of the piece the diseased coats are separating by sloughing, the sloughs adhering by one extremity and hanging down as string-like shreds, for the most part only a quarter to half an inch in length, but a few much longer. Higher up in the colon, it would appear from the report of the autopsy, the sloughs had completely separated in many places, leaving numerous ulcers.

The plate facing page 448 is a reproduction of a nature-size photograph of 1060, Medical Section, and represents the separation of dysenteric sloughs, at least one of which is of considerable dimensions as compared with those described in the last case. The disease was not recognized as dysentery during the life of the patient. The patient presented the symptoms of acute mania with homicidal impulse, and after shooting a comrade was placed in confinement, where he became very noisy, screaming, singing, etc. It was observed that his bowels were loose and the stools sometimes involuntary, but dysentery was not diagnosticated, nor was the fatal peritonitis, dependent upon intestinal perforation recognized until the abdomen was laid open during the autopsy. The following history of the case was furnished by Surgeon J. F. Hammond, U. S. A.:

CASE 891.—Private Joseph Von Gilden, company H, 4th cavalry; age 23; enlisted at New York City, November 25, 1869, and arrived at Austin, Texas, in February, 1870. For some time after his arrival he was an exemplary soldier, but for some unknown cause he incurred the ill-will of a portion of the men of his company, and they worried and perplexed him until he gave evidences of homicidal mania. June 13th, he fired a ball from his carbine, at a distance of ten or fifteen paces, through the leg of a soldier of the same company, comminuting his tibia, for which crime he was confined in the guard-house. He soon exhibited other signs of mania, and, on the 16th of July, was removed to a separate apartment in the post hospital at Austin. The condition of his bowels had never, at any time during his confinement for the crime, attracted attention as being abnormal, notwithstanding his stools were involuntary and while in hospital varied from three to nine per diem. July 20th, the first pre-

*Heliotype.* *James R. Osgood & Co., Boston*

RECTUM WITH SLOUGHING PSEUDO-MEMBRANE.

No. 703. MEDICAL SECTION.

scription for the condition of his bowels was given. His stools were lax, dark, feculent and abundant; mucus or blood had not been noticed in them. July 21st, the clinical thermometer gave his temperature at 12 M. as 99°.6; pulse 72. As he was very noisy, screaming and singing day and night, I recommended the general commanding the department, July 22d, to send him to the Government asylum in Washington under charge of a proper guard. 23d, he refused food for the first time, and also vomited that day. Active treatment was instituted, but he died about 6 A. M. the next day. During his whole confinement he made no complaint of any kind. *Autopsy* (Surgeon Hammond and Actg. Asst. Surgeon W. C. Crooks) 6¼ hours after death: Small muscular development; some emaciation; no rigor mortis; several ulcers at various points on his limbs and body. The dura mater was strongly adherent, its vessels turgid; the pia mater congested, most so posteriorly; cerebellum apparently softened, and more than the usual quantity of serum in the lateral ventricles. The convolutions of the brain were generally ill-developed, except on the front of the left anterior lobe. Lungs melanotic externally, no adhesions, crepitant throughout, ecchymoses at one or two points of the surface; both lungs full of dark blood; apparently some miliary tubercles on the surface of the left lung. The pericardium was distended with serum. The heart normal; clots of fibrin and black blood-clots in the right ventricle. The cavity of the abdomen contained a quantity of purulent serum. The stomach and entire intestinal canal were much congested, and contained a good deal of dark, fluid, feculent matter The ascending colon near its caput was firmly adherent to the parietes of the abdomen. Two large perforations of the colon were found just above these adhesions. The liver was deeply colored and dense. The gall-bladder was much distended with bile. The spleen was normal in size but dense. The kidneys and bladder were normal. The peritonæum generally was much inflamed. [No. 1060, Medical Section, Army Medical Museum, is from this case.]

In a note dated July 27, 1870, Surgeon Hammond stated that diarrhœa and dysentery were prevailing generally among the citizens of Austin at the time. The number of cases among the troops, however, was not large. Besides the fatal case of dysentery just reported, three other cases of acute dysentery and eight of acute diarrhœa, none of them fatal, appear on the post sick report for July, the mean strength of the command being 192 officers and men. The specimen represented in the plate consists of the cæcum and a portion of the ascending colon of this patient. A glass rod has been passed through the two perforations and can be seen in the upper portion of the piece. The mucous membrane is swollen but free from adherent pseudomembrane, and quite smooth except where sloughing is taking place. Patches of sloughing may be observed on various parts of the surface. The perforations evidently originated by this process. Near the lower extremity of the piece a large slough is separating, and exposes an irregular excavation about an inch and a half long by three-quarters of an inch wide, at the bottom of which the circular muscular coat of the colon is exposed. This slough is still adherent on the side farthest from the ileo-cæcal valve; its edges and the surfaces of the still adherent sloughs present a shreddy appearance, not unlike the sloughing surface shown in the last plate. On the peritoneal side of the piece the traces of the adhesions described in the autopsy can be seen. These appear to have prevented any considerable fæcal extravasation.

Still greater are the dimensions of the sloughs shown in the plate facing page 450, which is a reproduction of a photograph of No. 970, Medical Section. The specimen was too large to be shown of the size of nature on the page of this work, and the photograph has therefore been reduced in size one-fourth.

CASE 895.—Private John Bowers, company A, 44th United States infantry; German; age 41; admitted to post hospital, Washington, D. C., from Reynold's barracks, July 19, 1868. Acute dysentery. The patient was taken sick the day before admission. He had frequent discharges, as often as every forty-five minutes, which consisted of liquid fæcal matter mixed with mucus and blood: pulse 82, full but not strong; skin rather hot; tongue coated brown in the centre. The discharges were at first attended with great tenesmus, and there was moderate abdominal tenderness. There was thirst, anorexia, and the intellect was dull. Up to the fourth day after admission the discharges diminished in frequency, the blood gradually disappeared and remained absent until the day before death. The pain and tenesmus also gradually subsided, and by the end of the first week all complaint of pain had ceased. After the fourth day the operations increased in frequency, became somewhat yellowish, were liquid, very offensive, and continued so to the end. From about this time until the close of the case the stools were passed involuntarily. About the seventh day the abdomen became tympanitic and continued so; the hebetude increased, with occasional delirium of a low character; the pulse increased in frequency, and during the latter part of the time varied from 90 to 100 per minute; the temperature was continuously increased, varying from 99° to 102°; the tongue remained furred and soon became dry, continuing so until death, which occurred August 3d, fourteen days after admission. *Autopsy:* The descending colon and rectum presented extensive sloughing ulcers, as in the specimen.—Assist. Surgeon John Brooke, U. S. A. [No. 970, Medical Section, Army Medical Museum, is from this case.]

The specimen represented in the plate is a portion of descending colon from this case. As in No. 1060, but little pseudomembrane adheres to its mucous surface except at the points where sloughing is taking place; yet a large portion of the mucous membrane is infiltrated with exudation and was much swollen when the specimen was fresh. The sloughs, in places, are separating in shreds, but in the lower part of the piece they represent fragments of considerable size, which still adhere at points to the surface of the gut. The largest of these fragments is three inches and a half in length. Even larger sloughs than these are sometimes encountered in autopsies, still adhering at one extremity to their original seat, while the greater portion of the slough hangs down the intestinal canal. No. 997, Medical Section, [Case 94,*] is a striking example of this possibility, and shows a slough of this kind nine inches long which still adheres at one extremity.

The losses of substance produced by the separation of diphtheritic sloughs may be conveniently described as diphtheritic ulcers. Such ulcers are of the most diverse size, and vary from mere abrasions to deep excavations that expose or even invade the muscular coat. For the most part the edges of these excavations are irregularly bevelled, so that the bottom of the ulcer is smaller than the surface of mucous membrane destroyed. Sometimes, however, the edges are overhanging in places at least, in consequence of the sloughing extending farther in the submucosa than in the mucous layer itself. Very often, indeed, death ensues before the process of sloughing is completed, and the diphtheritic ulcers, so far as they have been developed, present no indications of the reparative process; but when the area of mucous membrane destroyed is not too extensive the patient may survive, the ulcers sometimes cicatrizing so that complete recovery ensues, or, more frequently, remaining in an indolent condition and a chronic flux persisting, which, after a variable period, proves ultimately fatal. The chromo-plate facing page 452 exhibits one variety of these diphtheritic ulcers. The following is an account of the case:

CASE 895.—Private Daniel Snow, company F, 2d New York heavy artillery; enlisted January 6, 1864, and is reported present with his company until after the first of May. On the muster-roll for May and June he is reported missing, and on that for July and August: "Absent; confined as a deserter by the provost-marshal." While in confinement he was attacked with dysentery, and became so sick that he was admitted to the field hospital of the 2d Army Corps at City Point, Virginia, September 6, 1864, where the diagnosis recorded was chronic dysentery. He appeared to be so ill that next day he was put on board the steamer Connecticut for transfer to general hospital. He was admitted to Douglas hospital, Washington, D. C, September 9th, and the following particulars were communicated by Asst. Surgeon Wm. F. Norris, U. S. A.: The patient was much emaciated, and, in addition to the usual symptoms of the advanced stage of dysentery, had jaundice and frequent bilious vomiting. The abdomen was flat and tender, the skin cool, the pulse feeble. He had stupor, low delirium and involuntary stools. Died, September 17th. *Autopsy:* Body somewhat emaciated and intensely jaundiced. Organs of the thorax healthy. [The state of the small intestine is not recorded.] The large intestine was greatly thickened, contracted in calibre, and presented, from the cæcum to the anus, numerous large, irregular, ragged ulcers, most of which involved the muscular coat. The ulcers had sharp, abrupt, ragged edges. In the caput coli there was a perforation the size of a dime. Externally the peritonæum covering the intestine was roughened and adherent to the right lobe of the liver for an extent of two inches. There was but little fæcal matter in the large intestine, which contained a number of black and gray fibrin-like clots. The liver contained numerous yellow metastatic foci from a quarter to half an inch in diameter; these were mostly in the right lobe and in the course of the branches of the portal vein; many of them contained a small drop of yellow fluid in the centre, and consisted, as seen under the microscope, of disorganized liver tissue, granular matter and fat globules, but no pus. The other abdominal viscera were healthy. [Nos. 448 and 449, Medical Section, Army Medical Museum, are from this case.]

A portion of the descending colon and the liver from this case were brought to the Museum on the day of the autopsy, and water-color drawings of the appearances presented made by Mr. Hermann Faber; these are reunited in the chromo-plate. The very large ulcer shown near the middle of the piece, and parts of some of the others, laid bare the muscular coat, which was smooth and shining, while the bottoms of some of the ulcers

* Page 65, *supra*.

*Heliotype.* *James R. Osgood & Co., Boston.*

CÆCUM WITH SLOUGHING PSEUDO-MEMBRANE.

No. 1160. MEDICAL SECTION.

only penetrated more or less deeply into the submucous connective tissue. The prevailing tint of the mucous membrane between the ulcers was yellowish, but it was streaked with bluish, gray and greenish tints, and in places brownish, reddish-brown or even bright red. Greenish or bluish neutral tints prevailed on the surface of the ulcers; their edges were rounded or bevelled, in but few places overhanging. The liver was dark brown externally, except where the metastatic foci described in the report of the autopsy were visible. Its cut section presented the nutmeg appearance in a marked manner and numbers of the metastatic foci. The description, given in the report, of the microscopical characters of these foci and of their relations to the portal vein was verified at the Museum. This case, then, is to be regarded as one of acute diphtheritic dysentery in which the sloughs had completely separated before death. The exact duration of the dysentery cannot be determined, but it probably set in some time after the deserter was captured by the provost-marshal, so that it is improbable that it commenced earlier than July, and it may not have done so until some time in August. The metastatic foci in the liver were quite like those which occur in pyæmia, and I am disposed to regard them as consecutive upon the colon ulcers.

Somewhat similar is the character of the ulcers shown in the chromo-plate facing page 454. The following is a history of the case:

CASE 897.—Private Taylor W. Glascow, company H, 110th Pennsylvania volunteers; age 31; admitted to Emory hospital, Washington, D. C., October 17, 1863. Chronic diarrhœa. This man enlisted September 25, 1862, and is reported on the muster-rolls of his company as present until March, 1863. Some time during April he was taken sick and sent to division hospital. June 14, 1863, he was admitted to the 1st division Alexandria hospital. Diagnosis, typhoid fever. He was, however, now in a convalescent condition, and was returned to duty with his regiment, August 11th. Shortly after he was attacked with dysentery, for which he was finally admitted to Emory hospital, as above stated. His disease now presented the aspect of a chronic flux. He was treated at first with pills of camphor and opium, but as the discharges from the bowels continued unabated, he was put to bed on the 21st, and tannic acid and opium substituted. Light diet. The diarrhœa was checked for a few days, but again grew worse about November 1st, when a chalk mixture was prescribed and a diet of boiled milk and toast. November 5th, he complained of pain in the abdomen. The diarrhœa was about the same. Substituted Parrish's camphor mixture and laudanum. November 11th, the patient complained of being unable to sleep. The diarrhœa remains about the same. Ordered mercury with chalk, and Dover's powder at night. November 15th, is worse. Stools more frequent. The patient appears much debilitated. Ordered pills of acetate of lead, opium and ipecacuanha; stimulants. Under this treatment he was again temporarily better, but again became worse about the 25th, when calomel and opium were substituted. December 3d, is much weaker; the diarrhœa unchecked. Stopped the pills; continued the stimulants. December 4th, at the request of the patient, procured him some blackberry brandy, which he seemed to relish; but in a few days discontinued its use, as it seemed to nauseate him. December 8th, is considerably emaciated, greatly prostrated and growing rapidly weaker. The stools are very frequent and tinged with blood. Ordered beef tea, brandy and a laudanum injection at night. Died, December 13th. *Autopsy:* The colon was considerably thickened and extensively ulcerated. [The condition of the other organs is not recorded.]—Acting Assist. Surgeon W. H. Combs. [No. 115, Medical Section, Army Medical Museum, is from this case.]

A portion of the descending colon from this case was brought to the Army Medical Museum immediately after the autopsy, and a water-color drawing made by Mr. Hermann Faber, of which the chromo-plate is a reproduction. The piece presents a number of ulcers, some of them of considerable size, which for the most part do not penetrate to the muscular coat, but invade the submucous connective tissue more or less deeply. The general surface of the mucous membrane between the ulcers is cream colored, with bluish and greenish streaks and patches. There are also a number of reddish patches in which the congested condition of the small veins is recognizable with the unaided eye. The bases of the ulcers are for the most part quite smooth, and similar in tint to the mucous membrane itself, but two of them are stippled with minute granulations; their edges are bevelled or rounded, not overhanging. This case, like the last, is to be interpreted as one of acute diphtheritic dysentery, which, in this instance, occurred not long after convalescence from typhoid fever. The precise duration of the disease is not shown by the record. It clearly commenced some time after the 11th of August, when the patient had sufficiently recovered from typhoid

fever to be returned to his regiment for duty; but it cannot have commenced very long afterwards, for when admitted to Emory hospital the disease had already so far advanced as to present the characters of a chronic flux. The duration of his last illness must therefore have probably been somewhere between three and four months, a sufficient time to permit the complete separation of all the diphtheritic sloughs, but the resulting ulcers were too numerous and extensive to permit recovery. The physician who made the autopsy was unacquainted with the fact that the patient had previously suffered from typhoid fever, and does not appear to have examined the small intestine for traces of that disease.

Another illustration of the characters of these diphtheritic ulcers will be found in the plate facing page 456, which is a reproduction of a nature-size photograph of No. 136, Medical Section. The following history of the case was contributed by Surgeon Geo. F. French, U.S.V.:

CASE 898.—Private Wm. B. Thornburg, company B, 95th Ohio volunteers; age 25; nervous temperament. Admitted to hospital No. 3, Vicksburg, Mississippi, October 12, 1863. Chronic dysentery. This man enlisted August 2, 1862, and was present for duty with his regiment until March, 1863, when he was detailed as an ambulance driver. He returned to his regiment in July. He says that he had diarrhœa much of this time, but had been free from it for awhile, when in September, 1863, he had a severe attack of dysentery, for which he was admitted to field hospital near Vicksburg on the 18th. At that time his stools were very bloody, the tenesmus severe, and there was almost constant pain in the region of the ascending colon. In about a week the stools began to assume a gelatinous appearance. For four days after the commencement of the attack the daily number of stools ran as high as twenty or even forty, but subsequently they diminished in number to from three to five in a day. The characters of the stools varied; sometimes they were of a dark jelly-like consistence, sometimes shreddy, flocculent or white. October 12th, when transferred to this hospital, the removal was attended with considerable suffering. October 18th, the patient complained of severe pain in the right hypochondriac region, which in a few days subsided into a dull heavy ache; subsequently he complained only of the degree of abdominal tenderness and pain usual in cases of dysentery. Cold night sweats were now frequent, and slight sordes appeared on the teeth a fortnight before death. November 1st, some œdema of the lower extremities is noticed. The patient is now greatly emaciated, his pulse very rapid and tremulous, his tongue smooth and very dry in the centre. Died, November 2d. Before entering this hospital the patient seems to have had very proper treatment and suitable diet. His bowels were first unloaded by a mild cathartic, to which in due time succeeded emollient and anodyne injections. Fomentations were applied to the abdomen, which was also painted with tincture of iodine. Diet: milk, beef essence, chicken broth and stimulants *ad libitum*. The same course of treatment was pursued after admission. *Autopsy* fourteen hours after death: The conjunctivæ were tinged slightly yellow, but the skin presented no appearance of jaundice. The lungs were perfectly healthy. There was an abscess in the anterior superior part of the right lobe of the liver containing twenty ounces of pus which had the odor of sour milk. The surface of the liver over the abscess bulged, and the abscess appeared to be pointing toward the cavity of the abdomen. The upper border of the right lobe of the liver was glued by strong adhesions to the diaphragm. The wall of the abscess in its thinnest part was one-sixteenth of an inch thick. The spleen was normal. The left kidney was fatty, considerably larger than the right, and of a livid green color; its pelvis contained a puruloid fluid. The stomach presented evidences of local congestion, and the first inch or two of the duodenum had a similar appearance. The valvulæ conniventes throughout the small intestine were tinged with bile. In the upper part of the ileum there was a tract about twelve inches long of an extremely dark red color, with softening of the mucous coat; farther down the mucous membrane presented here and there a livid green color. The mucous membrane of the whole tract of the large intestine was of a mottled, livid, greenish color, stained here and there with dark red spots, and overspread, as if worm-eaten, with ulcers of varying depths, some penetrating the mucous coat, others the muscular coat, and two through the serous coat of the bowel. In the lower half of the colon the ulcerations were so numerous as to present a reticulated or honey-comb appearance, like tripe. Some of them had rough ragged borders; in others the borders and bottoms of the ulcers were smooth and glazed; others were lined with a white, opaque, plastic lymph which was tenaciously adherent. In some places what were supposed to be cicatrices were observed. The shape of the ulcers, although very irregular, was mostly oval, the long diameter extending transversely across the bowel. Close beside the appendix vermiformis there were two perforations through the cæcum, one nearly the size of a dime, the other the size of a pea. Sufficient feculent matter had escaped into the abdominal cavity to discolor the wall of the abdomen contiguous to the cæcum. The tissues were deeply infiltrated, and not merely stained on the surface. There were also extensive adhesions of the upper part of the cæcum to the right iliac fossa, and around the perforations the intestine was glued to the wall of the abdominal cavity. Most of the adhesions were quite strong, those around the perforations, however, were soft and easily torn. [Nos. 132 to 137, Medical Section, Army Medical Museum, are from this case.]

The specimens preserved in this case are a series of pieces of the colon, all of which exhibit ulcers closely resembling in character those shown in the plate. In Nos. 132, 133, 134 and 135, which are portions of the ascending and transverse colon, the ulcers are less numerous and less closely set than in Nos. 136 and 137, which are portions of the descending colon; but in all of them a considerable part of the mucous surface of the colon has been destroyed. The ulcers are for the most part oval in shape, with their long diameters

*Heliotype.* *James R. Osgood & Co., Boston.*

DESCENDING COLON WITH SLOUGHING PSEUDO-MEMBRANE.

*(Reduced in size one-fourth.)*

No. 970. MEDICAL SECTION.

transverse to the axis of the bowel. In their central portions they expose the circular muscular coat, while towards the edges they only penetrate to the submucous connective tissue, so that for the most part they have bevelled edges, though in some places the edges are abrupt or even overhanging. In this case, between a month and a half and two months only elapsed from the commencement of the dysenteric attack to the fatal issue. The patient had previously suffered a good deal from diarrhœa, but had been free from it for some time before the commencement of his last illness, which is to be interpreted as an acute diphtheritic dysentery in which the process was so intense that the complete separation of all the diphtheritic sloughs took place within the period indicated. Symptoms due to the hepatic abscess found on the autopsy were first observed fifteen days before death, which resulted immediately from peritonitis, the consequence of the perforation of two of the ulcers and subsequent fæcal extravasation.

Death may occur at any stage of the diphtheritic process. In a few instances the patient, overwhelmed by the violence of the disease, succumbs before the sloughs have had time to begin to separate. In other cases the separation of the sloughs has commenced and progressed more or less; while in others complete separation takes place before the fatal issue. If the patient survives the separation of the diphtheritic sloughs a chronic flux often results, which persists for an indefinite period with ultimate recovery or death. It is a most important pathological fact, of precious significance in connection with the prognosis, that even very extensive ulcers resulting from diphtheritic sloughing may under favorable circumstances completely cicatrize. The cicatricial tissue contracts considerably, and the edges of the ulcer are then approximated, so that the resulting cicatrix is much smaller than the original loss of substance. The approximation sometimes takes place laterally, a circumstance which it might be supposed the surviving functional activity of the circular muscular coat would favor; but very often also it takes place longitudinally, and oblique or transverse cicatrices result. The cicatrices are very generally more or less puckered, and in extreme cases stricture of the bowel may result from this circumstance.* I have not been able to collect statistics with regard to the frequency of cicatrization. The patients survive an indefinite length of time, and when they ultimately die of some other disease, even if an autopsy is made, the intestinal cicatrices are apt to be overlooked.

The plate facing page 458, which is a reproduction of a photograph of No. 1003, Medical Section, in which the preparation is represented one-half larger than the natural size, is a striking representation of the cicatrices of diphtheritic ulcers. An account of the case has been given in the previous section, [case 875.] The patient, a mulatto man, who is said to have been a soldier and afterwards an officer's servant during the war, died November 11, 1868, of pleuropneumonia. It is stated in the report that he "is supposed to have suffered from diarrhœa during the war." The flux, however, was undoubtedly diphtheritic dysentery, and numerous large ulcers must have existed, for cicatrices similar to those represented in the plate were found "over the entire surface of the large intestine." The plate represents a portion of this colon about five inches long, on the surface of which, besides several minor ones, are three conspicuous cicatrices. The first or uppermost is a linear one, slightly curved and about an inch and a half long in the specimen, which runs obliquely downward as it goes across the piece from left to right. Just below this is a second much larger and more complete cicatrix, fully three inches long in the specimen,

* An excellent description of these cicatrices will be found in ROKITANSKY'S *Lehrb. der Path. Anat.*, 3te Aufl., Vienna, 1861, Bd. III, S. 209.

which consists of a perpendicular sigmoid portion on the left, from near the centre of which a linear cicatrix runs with a sinuous course across the whole piece. In the course of this transverse line there are two points at which the cicatrix extends so as to cover an irregular somewhat stellate area. The lower half of the piece is occupied by a third, much larger, irregularly branching cicatrix, which consists of two perpendicular portions (one seen a little to the left of the middle of the piece, the other at its edge on the right) connected together by irregularly branching transverse cicatricial lines. The enterotome has unfortunately made two perpendicular cuts in the central perpendicular portion of this cicatrix which gap widely in the preparation, and are of course so represented in the photographic plate. A similar, but much smaller, accidental cut appears near the right extremity of the central cicatrix. Notwithstanding these accidents the specimen displays the characteristic features of diphtheritic cicatrices so much more handsomely than any other specimen as yet received at the Museum that it was selected for this illustration. The ulcers thus healed must have been numerous, of large size, and must have penetrated deeply into the submucous connective tissue, if not quite to the muscular coat.

After the edition of the plate just described had been struck off I obtained a photograph of a part of the same preparation enlarged rather more than three diameters, which showed all the details in the characters of these cicatrices with such admirable distinctness that I have thought it worth while to present it to my readers as an additional illustration. The plate facing page 460 is a reproduction of this photograph, which was obtained indirectly by a photographic enlargement of the negative from which the former plate was prepared. By this device, notwithstanding the enlargement, the greater portion of the piece shown is nicely in focus, and the first negative, having been made by an excellent photographic combination (Dallmeyer's wide angle recto-linear) from the preparation floating in a bath of distilled water, has borne the enlargement in a satisfactory way. In examining this plate the eye is at once struck by the presence in almost all parts of the surface of the intestine of numerous black circular depressions, rather larger than pin-pricks, which are in fact the orifices of the tubular glands of Lieberkühn, and which can be advantageously studied with a magnifying glass. These disappear on the summits of the more prominent folds of the mucous membrane, simply because out of focus. This plate represents a considerable part of the central and lower cicatrices shown in the last plate, and between them two smaller isolated cicatrices. The unfortunate accidental cuts in the lower cicatrix make a conspicuous appearance, but do not interfere with the representation of the cicatrices.

It will be seen that the characteristic feature of these cicatrices is the presence of a smooth central cicatricial area or line, from the margins of which branching cicatricial ridges radiate and entangle the adjacent glands of Lieberkühn in their meshes. On the left of the accidental cut in the lower cicatrix there is an area of mucous membrane of some extent, which is thickened and deformed by these cicatricial ridges. Such areas represent portions of mucous membrane adjacent to the original ulcers, which, however, were not destroyed by the ulcerative process. The site of the original ulcers is indicated by the central cicatricial area or line, the size of which, however, is many times smaller than the original loss of substance. Between the cicatrices may be seen some forty or fifty small oval or circular depressions, looking as though cut out of the mucous membrane by a punch; they are also shown, though less distinctly, in the previous plate, and are in fact tiny follicular ulcers. These probably represent a slight recent intestinal catarrh accompanying the fatal pleuro-

pneumonia, as often happens in such cases. The statement in the report that the patient "had no symptoms of any abdominal disease while in hospital," must be received with reserve, since the reporter was not the attending physician, and no record of symptoms and treatment was kept, at the time, in the almshouse in which this man died.

In this connection I may also refer to specimens Nos. 922 and 923, Medical Section, which are portions of the colon from a case of diphtheritic dysentery reported in the last section, (case 874.) Each presents several large irregular granulating ulcers, and of these one in each piece particularly well illustrates the healing process. The excavation made by the ulcerative process in these ulcers has been filled nearly to the surface with granulation-tissue; the edges of the ulcer appear already to have considerably approximated, and the surrounding mucous membrane is a good deal puckered. It is easy to see that, had the process continued to completion, a linear cicatrix running in a transverse direction would have resulted in each place.

On an examination of the previous sections of this work, I find fifty-five autopsies in which, either from the mention of pseudomembranous or diphtheritic deposits, or of other details recorded by the reporter, or from the specimens preserved at the Museum, I am satisfied that the cases were examples of diphtheritic dysentery. I find, also, fifty-three other autopsies in connection with which the testimony is not so positive, but which were probably of the same nature. To the first group belong cases 92, 93, 94, 97, 132, 141, 143, 160, 161, 169, 176, 192, 204, 206, 239, 271, 278, 284, 286, 302, 306, 309, 315, 317, 340, 344, 346, 354, 357, 358, 362, 367, 369, 372, 373, 382, 392, 400, 425, 429, 430, 436, 502, 561, 566, 579, 587, 684, 685, 811, 841, 852, 857, 867 and 874. It will be seen by examining the histories of these cases that in twenty-nine of them specimens have been preserved in the Museum. These specimens, the numbers of which are mentioned in connection with the record of the autopsy in each case, afford a tolerably complete series representing the various phases of the diphtheritic process and of the ulcers which result from the separation of diphtheritic sloughs.

In many of the cases just enumerated the disease may properly be spoken of as acute. In some of them death took place during the second week or even earlier; in others the time at which the patient was taken sick is not definitely stated, and only the duration of treatment in general hospital is given, which varies from a few days to two months or more, the longer periods not being very frequent. In ten of the cases only does the record extend beyond three months, viz: in cases 97, 161, 309, 852 and 874 between three and five months; in cases 382 and 566 over six; in cases 354 and 685 over seven; and in case 857 over nine months. Some of these were undoubtedly cases of diphtheritic dysentery, in which the ulcers left after the separation of the sloughs, served to keep up the chronic flux that finally destroyed life. I do not doubt that such ulcers often cause chronic fluxes, and think it highly probable that many of the cases of these fluxes hereafter to be referred to, in which the record of the autopsy simply describes the large intestine as "extensively ulcerated," were really of this nature. I am by no means sure, however, that this explanation applies to all the ten cases just enumerated. In one of them, for example, case 566, the patient appears to have had a chronic flux for six months, which, however, did not prevent him from doing duty, and was, therefore, most probably dependent, as so many such fluxes were, upon a chronic intestinal catarrh. Acute dysentery supervened only three weeks before death. Perhaps a similar explanation applies to some of the other protracted cases.

In most of the cases of this first group the diphtheritic process was limited to the large intestine. In cases 92, 93, 362, 372, 392, 587 and 867 the small intestine appeared to be healthy. In some of the other cases the condition of the small intestine was not recorded, but in the majority of them congestion, redness, enlargement of the solitary follicles or other evidences of catarrhal inflammation were observed. In cases 94, 201, 284, 340, 354, 373, 382, 400 and 811 the diphtheritic process had extended into the ileum, as evidenced by the presence of the characteristic exudation upon the mucous surface for a greater or less distance above the ileo-cæcal valve.

The second group of cases which belongs in this place comprises those in which the record of the autopsy is less explicit indeed, yet describes phenomena that on the whole more closely resemble those of diphtheritic dysentery than any other morbid process. Here are included cases 81, 82, 107, 197, 203, 205, 215, 216, 221, 226, 238, 242, 243, 244, 246, 253, 256, 257, 259, 270, 313, 325, 338, 437, 439, 472, 508, 514, 516, 589, 591, 594, 613, 616, 627, 628, 630, 652, 669, 677, 679, 682, 693, 710, 712, 750, 779, 784, 800, 816, 824, 827 and 832. The record indicates that almost all of these were cases of acute dysentery. In many of them, however, the reports only give the duration of treatment in general hospital, which varies from a few days to two months or more. In none of the cases does the record cover a longer period than three months. In all the cases of this second group the record of the condition of the colon lacks technical precision, yet the language used generally indicates quite clearly the nature of the process. Thus, we are told that the mucous membrane was extensively mortified; that it was gangrenous, gangrenous throughout, gangrenous in patches, spots or places; that it presented patches of sloughing, or oval sloughs; that it was disorganized by ulceration and sloughing; that it was disorganized; that it was extensively ulcerated and almost gangrenous; that it was so far destroyed by ulceration that only islets of mucous membrane were left; that it was extensively ulcerated, and the like. In cases 197, 244, 313, 325, 516 and 613 the small intestine is stated to have been apparently healthy, and in a somewhat larger number its condition is not recorded, but in a majority of them it is either distinctly stated that more or less of the mucous membrane of the small intestine was inflamed, or it is spoken of as congested, much congested, softened, its solitary follicles enlarged, and the like.

The general remarks which follow apply to both the groups mentioned above. In eleven cases perforation of the intestine is said to have occurred. In cases 132, 244, 338 and 750 the perforation took place in or near the cæcum; in the last named case there were also two perforations in the colon. In case 627 there was probably a perforation in the transverse colon; in case 215 at the junction of the transverse and descending colon. In case 561 there were two perforations in the descending colon. In case 253 it is merely recorded that there was a perforation in the colon. In case 436 it is stated that there were more than twenty perforations in the colon. In case 243 the record states that the ileum, as well as the large intestine, was ulcerated, and that several of the ulcers had perforated, without mentioning whether this accident occurred in the large intestine or the small. In case 382 a perforation in the cæcum communicated through an abscess-cavity in the iliac region with a perforation in the ileum just above the ileo-cæcal valve. In some of these cases it is recorded that evidences of peritonitis, with or without fæcal extravasation, were observed; in others the record is silent as to this point. I am inclined, nevertheless, to regard most of them as cases of actual perforation, though it must be acknowledged that

the rents made by unskilful dissectors in removing the colon, when its walls are greatly weakened by ulceration or sloughing, have sometimes been mistaken for perforations when none actually existed.

Evidences of more or less extensive and severe peritoneal inflammation were observed, besides, in a number of instances in which no perforation existed, as, for example, in cases 238, 437, 811 and 816. In cases 221, 358 and 867 the intestines were agglutinated by general peritoneal adhesions. In case 784 the adhesions were limited to the ascending, in case 613 to the descending, colon. In several cases, also, local peritoneal adhesions were observed which, in some of them, possibly resulted from former local peritonitis unconnected with the dysenteric attack. Thus in case 325 the transverse colon was adherent to the liver. In case 253 there was a similar adhesion, and others also existed between the liver and diaphragm, and between the right kidney and the liver. In case 508 a limited portion of the cæcum was adherent to the abdominal parietes. In case 97 the cæcum was more extensively adherent, and the vermiform appendix had also contracted adhesions to the abdominal parietes of such a character that its extremity was attached just below the umbilicus. In all these instances the intestinal canal was involved in the adhesions; but in case 340 they were limited to the liver, spleen and adjoining abdominal walls; in cases 317 and 710 they connected the liver and the diaphragm; and in case 176 the record simply states that there were old adhesions about the spleen.

In this connection, also, must be mentioned case 141, in which, from the autopsy, it would appear either that typhoid fever had supervened during the progress of a chronic flux, or perhaps more probably that diphtheritic dysentery had set in during convalescence from typhoid fever. The ulcers in Peyer's patches, as seen in one of the specimens from this case, [Nos. 232 and 233 Medical Section, Army Medical Museum,] look as though the healing process was well under way, while in the other specimen the diphtheritic sloughs have completely separated, leaving the characteristic ulcers. Both processes, therefore, were in an advanced stage; perforation had taken place in three of the ulcers of the small intestine, and general peritonitis resulted. The association of diphtheritic dysentery with the characteristic typhoid lesion of Peyer's patches, illustrated by this case, was by no means of rare occurrence. Among the cases under consideration, 192, 226, 278 and possibly 800 may be cited as additional examples of this coincidence, and several others will be brought forward in the chapter on camp fevers, where the subject of this complication will be more fully discussed. There are also among the cases at present under consideration quite a number in which the small intestine, especially the ileum, is said to have been ulcerated, and some of these may possibly have been examples of the complication with the typhoid process. Cases 203, 204, 205, 271, 286, 317, 346, 502, 616, 750, 781 and 832 are the ones referred to. An examination of the record in these cases will show that some of them are simply examples of diphtheritic or catarrhal ulceration resulting from an extension of the inflammatory process to the small intestine; but in others the description is so imperfect that the nature of the ulcers is uncertain. It is worthy of note, also, that in several other cases the disease at some period during its progress was erroneously diagnosticated typhoid fever, while on the autopsy only the lesions of diphtheritic dysentery were found. Cases 197, 246, 302, 338, 341 and 425 are examples of this error.

A few other facts with regard to the condition of the intestinal canal recorded in the autopsies under discussion are of interest. Intussusceptions of the small intestine unaccom-

panied by symptoms of obstruction of the bowels during life, or by indications of resulting inflammation observed after death, were less frequent than in the cases of catarrhal inflammation enumerated on page 310. But two examples are recorded, viz: Case 627, in which one intussusception was observed, and case 677, in which there were two. Accumulations of gas in the alimentary canal must have occurred much more frequently than is mentioned in the reports. Only in cases 253, 472 and 628 are we told that the intestines were distended with gas. Scybala are mentioned in but one case, 243, in which it is stated that "a quantity of scybala was impacted in the cæcum."

The condition of the *stomach* is not recorded in all the cases, nor is the character of its contents often mentioned. It is spoken of as distended with flatus in cases 243, 270, 271, 325, 425, 429 and 784; distended with mucus containing some pus in case 216. On the contrary it is said to have been contracted in case 160, and much contracted in case 302. More or less congestion of the gastric mucous membrane, either in patches or universally, is said to have been observed in cases 94, 132, 197, 204, 246, 284, 340, 354 and 710. It is affirmed that it was inflamed in cases 143, 161, 325 and 508. In case 284 the mucous membrane was much injected, and small patches of pseudomembrane were adherent at several spots; in case 271 it was covered with a pseudomembrane the color of bile. The gastric mucous membrane is said to have been softened in case 344; thickened and softened in cases 425 and 429; abraded in case 306. In case 874 an oval spot the size of a ten cent piece, apparently a healed ulcer, was found on the mucous membrane of the lesser curvature of the stomach. The condition of the *œsophagus* was not often recorded. In case 346 it is stated that a large patch of its mucous membrane, beginning two inches below its commencement and extending downward four inches, was softened and ulcerated: "There were several separate ulcers, some of which were coated with a greenish disorganized substance."

*Lesions observed in other organs in diphtheritic dysentery.**—In most of the cases in which the *appearance of the body* is recorded it is spoken of as emaciated, much emaciated or extremely emaciated. In cases 203, 338, 373, 429, 566 and 710, however, it is stated that there was not much emaciation; in cases 369 and 867 that the body was not emaciated; and in cases 204 and 367 that it was well developed. More or less diffuse ecchymosis of the skin of the trunk, or of the trunk and extremities, was observed in cases 132, 143, 160 and 169. All these observations were made by Dr. J. Leidy. In the record of case 160 he remarks: "The ecchymosed spots, examined with the microscope, appeared to be a staining of the dermis with the coloring matter of the blood-corpuscles." If, as I doubt not, similar discolorations existed in some of the other cases, they were not regarded as of sufficient importance to be made a matter of record. In case 161 the left lower extremity was œdematous; in case 132 bed-sores were noted; in cases 246 and 784 the skin was jaundiced. In case 206 an ulcer of the cornea was observed in each eye. The man had been attacked with diphtheritic dysentery three weeks before admission to general hospital and died seven days afterwards, so that his disease had lasted four weeks. This lesion did not attract attention in any other of the cases under consideration. An abscess was found in the left parotid gland in case 516.

* The statements which follow are based upon an analysis of one hundred and fifteen cases of diphtheritic dysentery, viz: The 108 cases enumerated on pp. 433 and 451, and the 7 cases (Nos. 892–898 inclusive) selected for the pictorial representation of the lesions of this form of disease. I am not acquainted with any previous attempt to tabulate the lesions observed in other organs in any considerable number of cases of diphtheritic dysentery. Most of the studies in this direction refer to a certain number of cases of "dysentery," including all forms of the disease. In a few instances only are acute and chronic cases separated. I shall refer to some of these studies in a subsequent portion of this section in connection with the undetermined cases of chronic dysentery.

*Heliotype*

DESCENDING COLON WITH OVAL ULCERS.

No. 1[illegible] MEDICAL SECTION

*Cranial cavity.*—No very significant lesions were observed in the *brain* or its *membranes* in any of the cases in which the head was opened. In cases 340, 344, 346 and 373 the brain is said to have been more or less softened, and in case 354 congested; in cases 197, 203, 204, 205, 367, 373, 710 and 894 its membranes are said to have been more or less extensively congested. In cases 205, 382, 710 and 891 the quantity of subarachnoid fluid is said to have been considerable, or larger than usual; in case 344 the quantity is definitely stated as two ounces and a half. Several globular cysts were observed in the choroid plexus in case 358, and congenital absence of the middle commissure of the brain was noted in cases 354 and 516. In the majority of the cases under consideration, however, the cranial cavity was not opened.

*Respiratory organs.*—These were generally examined, and often presented important lesions. *Diphtheria* was not noted in any of the cases, unless perhaps case 256, in which it is recorded that "the mucous membrane of the pharynx and larynx was inflamed, thickened and ulcerated," bears this interpretation. Nor was *bronchitis*, unconnected with pneumonia, recognized in any autopsy, perhaps because, so far as I have been able to ascertain, the bronchial tubes were not systematically examined. In case 338 both lungs were congested, and the same condition is affirmed of the bronchial tubes; probably bronchitis existed also in some others of the cases in which the lungs are simply said to have been congested. There are about twenty cases in which this latter condition is affirmed of one or both lungs; in some of these it was recognized to be merely hypostatic, and probably some of the others were of the same character.

*Pneumonia* was a frequent and important lesion, which in some instances was undoubtedly the immediate cause of death. It was recognized in more than a sixth of all the cases. In one of these, case 197, lobular pneumonia existed on the right side. In the others the affected parts are spoken of as hepatized red or gray, or simply hepatized. This condition involved a portion of the right lung in cases 253, 340, 392, 400 and 630; of the left lung in cases 354 and 677; of both lungs in cases 216, 591 and 679. A similar condition of the lung, combined with pleuritic effusions of serum or lymph, or with recent pleuritic adhesions, involved the right lung in cases 143, 302 and 627; the left in cases 226, 669 and 841; both lungs in cases 313, 344 and 362. In case 160 the lower part of the superior lobe of the left lung contained a multitude of purulent foci, and was adherent by plastic matter to the pleura costalis. These lesions are probably to be interpreted in the same manner as the purulent foci in the liver in case 896.

*Pleurisy* was observed in several instances. Thus in case 358 the pulmonary pleura between the lobes of the right lung was roughened by whitish points of exudation, and two patches were observed, one in the upper and one in the lower lobe, in which the lung-tissue was carnified. In case 317 a copious effusion of sero-purulent liquid in the left pleural sac compressed the left lung against the vertebral column; both lung and costal pleura were coated with a thick layer of lymph. In case 259 the left pleural cavity was filled with pus, and the lung, collapsed to a fourth of its normal size, formed a firm flesh-like mass adherent to the spine; in this case also an abscess had formed between the fourth and fifth ribs which appeared about to point externally. Pleuritic adhesions, probably old, were observed in a number of instances: on the right side in cases 161, 369, 372, 429, 579, 693, 710, 779 and 784; on the left side in case 892, and on both sides in cases 176, 204, 205, 373, 425, 516 and 871.

*Tubercles*, for the most part limited to the apex, were found in the right lung in cases 382 and 693, in the left lung in case 894, and in both lungs in cases 81, 204, 346, 630, 832 and 867. In cases 94 and 874 there were not only tubercles in both lungs, but a tubercular cavity existed in each on the right side. Obsolete cretefied tubercles were observed in both lungs in case 340. The *bronchial glands* are spoken of as large in cases 344 and 346; tubercular in case 874. In case 367 the bronchial glands at the bifurcation of the trachea contained a calcareous deposit.

*Circulatory organs.*—Recent *pericarditis* was observed in case 226; the surface of the heart was coated with fibrinous lymph and the sac of the pericardium contained nearly a pint of fluid; pleuropneumonia existed on the left side in this case, as already mentioned. A very similar condition existed in case 317; the heart was covered with a layer of fibrinous lymph, and there was in the pericardium a considerable effusion of serum in which shreds and flakes of lymph floated free; in this case, as already mentioned, pleurisy existed on the left side, with a bulky effusion and collapse of the lung. In case 894 the pericardium was distended with serum; in case 81 it contained between ten and twelve fluid ounces. Smaller quantities of fluid, varying from two to four ounces, were found in the pericardium in cases 132, 278, 358, 392, 425 and 429, and still smaller quantities in a number of others. In case 259 the pericardium throughout its whole extent was adherent to the heart; in this case, as already mentioned, empyæma and collapse of the lung existed on the left side.

The *heart* is spoken of in several cases as soft, flabby, devoid of adipose tissue, thin-walled or small, and the latter condition is in several others indicated by the weight recorded; thus in cases 354, 357 and 400 the heart is said to have weighed but seven ounces, and in case 226 only six, notwithstanding its coating of lymph. The weight of the heart is recorded in about a dozen other cases, and ranges from the figures just given to eleven ounces; in but one case is a greater weight than this recorded, viz: Case 362, in which the heart weighed 12¼ ounces. In case 271 the heart is spoken of as "somewhat enlarged," and in case 616 as "very large, but apparently healthy; no valvular disease." *Valvular disease* was observed in several cases. In case 338 the aortic valves were thickened and their adjacent edges interadherent; in case 779 the mitral valve was much thickened, and in case 867 the edges of the tricuspid valves are said to have been thickened. Slight atheroma of the aorta just above the semilunar valves was observed in cases 358 and 362, and in case 784 the arch of the aorta is said to have been unusually large.

Whitish or yellowish *fibrinous coagula*, with or without an admixture of black coagula, were observed in the cavities of the heart in a number of the cases. Clots of the first kind were found in the right side of the heart only in cases 226, 338, 354, 362, 429, 630 and 779; in the left side only in case 340, and in both sides in cases 197, 204, 270, 344, 369, 372, 373, 679 and 867. Mixed clots were found in the right side in cases 357 and 894; in both sides in case 143. In case 205 fibrinous clots were found in the right side and black ones in the left; in case 346 fibrinous clots were found in the right side and mixed ones in the left; in case 516 fibrinous in the left and mixed in the right. The fibrinous clots in the cardiac cavities extended into the pulmonary artery in cases 197, 362, 369 and 372; into both pulmonary artery and aorta in case 373. In case 841 "there were large clots in the right side of the heart extending into the pulmonary vessels; a small clot in the left ventricle;" but the nature of these clots is not explicitly stated. In case 160 the heart contained no clots, "but yellow clots occupied the arch of the aorta and the pulmonary

*Heliotype.* *James R. Osgood & Co., Boston.*

COLON, WITH CICATRICES OF DIPHTHERITIC ULCERS.

No. 1003. MEDICAL SECTION.

[ENLARGED ONE-HALF.]

arteries." The significance of clots such as these will be discussed when the subject again comes up in a subsequent portion of this section in connection with the autopsies in cases of chronic flux.

*Abdominal organs.*—The *liver* is spoken of as congested in some half dozen cases, in as many more it is said to have been soft or softened; it is also spoken of in a few cases as anæmic or as pale. It is said to have been fatty in cases 161, 197, 226, 242, 302, 309, 344, 358, 382 and 750; and from the description given was probably also fatty in cases 338 and 340. In case 94 the liver was "a good example of the so-called drunkard's liver;" in case 566 the organ presented "some tendency to cirrhosis at its anterior border." In a few cases the liver is spoken of as abnormally small; in others as large or enlarged. These conditions are also shown to have existed in several instances by the recorded weight of the organ, which was but 39½ ounces in case 354, and 33¼ ounces in case 357; while in cases 286 and 362 it weighed 71 ounces, 76½ ounces in case 369, 81 ounces in case 750, 84½ ounces in case 344, and 86 ounces in case 204.

*Abscesses of the liver* were observed in seven of the cases under consideration. In case 712 there was a single abscess, containing about four ounces of pus, in the right lobe of the liver; in case 92 "the liver was occupied by an enormous abscess, pointing and about to break through the diaphragm into the right pleural sac, almost pointing also below, several square inches of the under surface of the organ being soft and of a dull-green color;" in case 205 the liver "contained a considerable number of metastatic foci, many of which had softened into a puruloid liquid;" and in case 867 there were "a number of metastatic foci in its right lobe." In case 203 numerous little yellowish-white nodules, the largest the size of peas, were scattered through the substance of the liver. Assistant Surgeon McGill, who reports the case, expresses no opinion as to their nature, but a perusal of his account will leave little doubt that they were really metastatic foci similar to those described in case 896. In case 898 there was a single abscess containing twenty ounces of pus in the right lobe of the liver, and in case 896 the liver contained numerous yellow metastatic foci from a quarter to half an inch in diameter. In all we have three examples of single abscesses and four of multiple metastatic foci, or seven cases out of one hundred and fifteen of diphtheritic dysentery. It has already been mentioned that in case 171 two multilocular hepatic abscesses coexisted with evidences of intestinal catarrh without ulceration. Several other cases of hepatic abscess will be mentioned in a subsequent portion of this section in connection with the post mortem appearances of chronic flux; the comparative frequency of hepatic abscess as a complication of diarrhœa and dysentery in this and other countries will then be commented upon. Miliary *tubercles* were observed in case 346 scattered through all parts of the liver; tubercles were also scattered through all the lobes of both lungs.

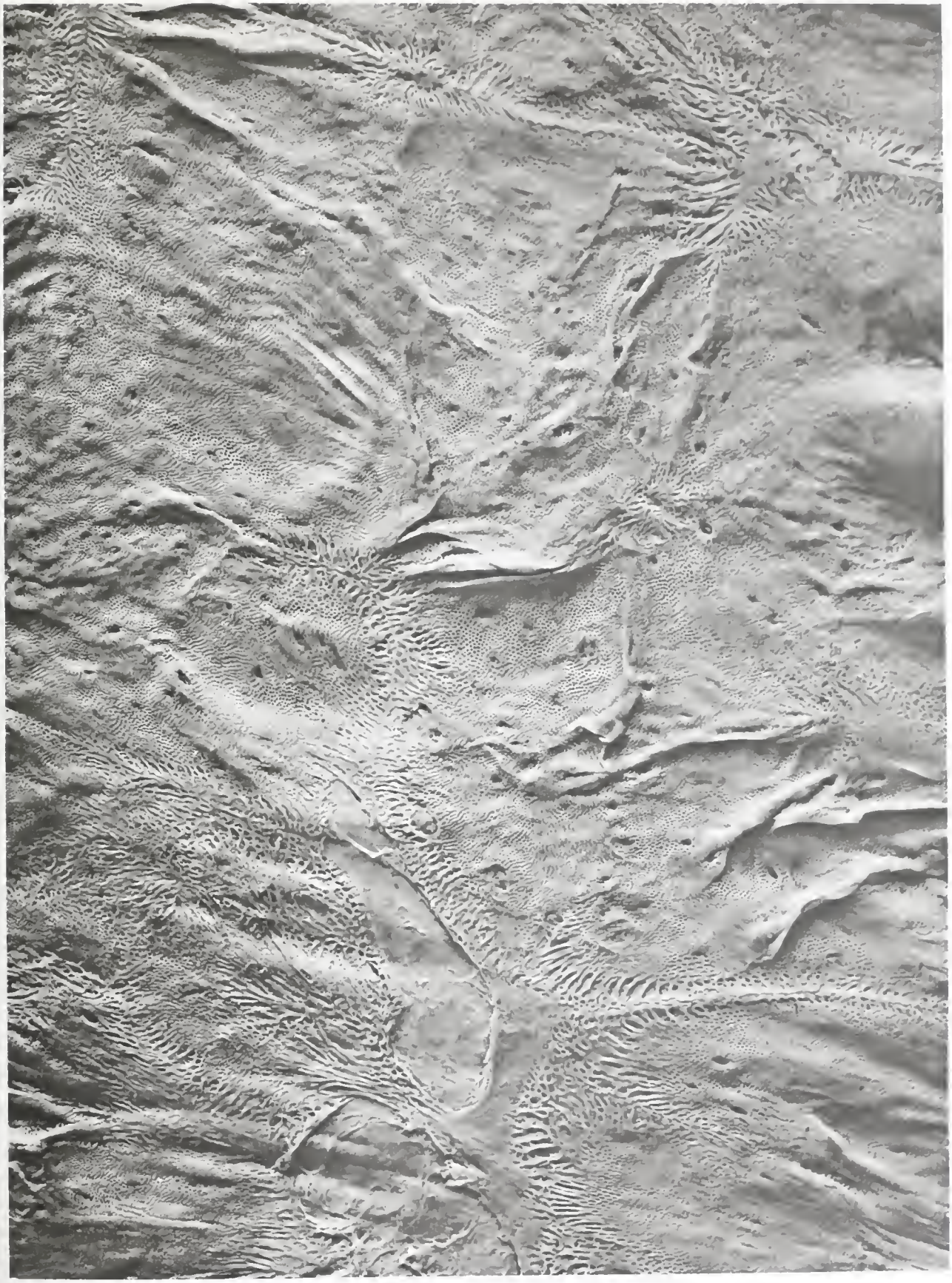
In many of the cases no mention is made of the contents of the *gall-bladder;* in about a dozen it is said to have contained but little bile, or quantities varying from a drachm to an ounce are mentioned. On the contrary, in cases 160, 197, 243, 246, 256, 278, 286, 306, 372, 429, 566, 627, 677, 710, 779, 784, 867 and 894 it is spoken of as full of bile or distended with bile, and in case 357 "the gall-bladder contained from four and a half to five ounces of bile." In most of these cases the appearance of the bile is not described, but in case 256 it is said to have been tar-like; in case 197 thick and black; in case 306 very dark and viscid; in case 566 thick, greenish and glairy; in case 372 yellowish and turbid;

in case 779 dirty-colored; and in case 243 normal. Gall-stones were observed in case 325, in which the gall-bladder contained two calculi each the size of an ordinary marble; and case 439, in which "two large gall-stones" were found in the gall-bladder.

The *spleen*, in several cases, is spoken of as congested, and in a still larger number as softened. In about a dozen cases it is spoken of as large, or enlarged, and in a somewhat smaller number of instances as small. In a number of instances the weight of the organ or its dimensions are recorded, and these sometimes indicate abnormally great size; sometimes the reverse condition. Thus the weight given is 8 oz. in case 382; in case 340 it is 9½ oz.; in case 362, 10½ oz.; in case 369, 14 oz., and in case 205, 15 oz. In case 392 the spleen measured 7½ inches by 4; in case 425, 8 inches by 4; in case 816 it was "at least five times its natural size, and very hard when cut." On the contrary the weight given in case 357 is 2½ oz.; in case 354, 3 oz.; in case 346, 3¾ oz.; in cases 400 and 579, 4 oz.; in cases 372 and 373, 4½ oz.; in case 367, 5½ oz.; and in case 516 the dimensions reported are 2½ inches by 1½. In case 354 a small supplementary spleen was observed. The *mesenteric glands* are spoken of as enlarged in about two dozen cases. In case 256 they are said to have been very much enlarged and hard; and in case 270, enlarged and engorged with blood. In a few of the cases the condition of the *pancreas* is noted, but nothing of a definite character appears to have been observed. In case 246 it is said to have been "indurated and livid;" in case 710, unusually large but healthy; in case 197 the pancreas weighed 4 oz., and in case 362 it weighed 4½ oz., but is said to have been of normal color.

The *kidneys* are sometimes spoken of as flabby, or as pale, or it is said that their cortex was pale. In case 566 "the kidneys were fatty, and softer than normal; in the inferior part of the external surface of the right kidney there was a cyst of moderate size;" in case 867 the kidneys weighed 5½ oz. each; the cortical substance of both had a waxy appearance; the pyramids were pinkish-red. The weight of the kidneys is given in a number of cases, and in several appears to indicate that one or both kidneys were enlarged. Thus, in case 203 the right kidney weighed 5½ oz., the left 7½; in case 357 the right weighed 5½ oz., the left 7¼; in case 206 the kidneys were enlarged, one of them weighed 7 oz.; in case 362 the right kidney weighed 10½ oz., the left 9½; both kidneys were pale and flabby; in case 816 "the kidneys were nearly double their normal size, and when cut into pus was found in all the calyces." A somewhat similar condition was noted in the left kidney in case 898.

Simple cysts were observed in one of the kidneys in case 566, as just mentioned; in case 340, in which there was "a small cyst" in the lower part of the right kidney; and in case 693, in which the left kidney contained a cyst holding about a drachm of fluid. In case 278 extensive cystic disease existed in both kidneys; the left was largest, being about six times the normal size of the organ. The specimen has been preserved at the Army Medical Museum, [No. 164, Medical Section.] Congenital displacement of one of the kidneys was observed in two cases; in case 97 the left kidney reposed on the promontory of the sacrum, and was supplied by four renal arteries given off from the bifurcation of the aorta, [No. 525, Medical Section;] in case 317 the right kidney reposed upon the second lumbar vertebra, and was converted into a cyst containing several ounces of an amber-colored liquid, [No. 361, Medical Section.] Finally, in case 811 a considerable number of calculi, composed chiefly of oxalate of lime mixed, however, with some phosphates, were found in the pelvis and calyces of the left kidney, [No. 593, Medical Section.]



*Heliotype.* *James R. Osgood & Co., Boston.*

CICATRICES OF DIPHTHERITIC ULCERS IN THE COLON.

No. 1003, MEDICAL SECTION.

[ENLARGED A LITTLE OVER THREE DIAMETERS.]

In a few cases the appearances of the *suprarenal capsules* is noted, and the descriptions in cases 340, 344, 346 and 351 would appear to indicate an abnormal condition of these organs; in case 346 there were two small cysts in the upper part of the left capsule. No abnormity of the *urinary bladder* appears to have been observed except in case 816, in which it is stated that the mucous membrane of the bladder was "very vascular;" and in case 338, in which "the bladder was hypertrophied." In the majority of the autopsies the condition of the urinary bladder is not mentioned.

PATHOLOGICAL HISTOLOGY OF THE DIPHTHERITIC INTESTINE.—For the pathological histology of the intestine in simple inflammatory dysentery without ulceration, the reader is referred to the account already given of the inflammatory process in the intestine as described in connection with acute diarrhœa. The minute anatomy of follicular ulceration, when it occurs in acute dysentery, does not differ essentially from what will be hereafter described in connection with the chronic fluxes. In this place, therefore, the histology of the diphtheritic process alone will receive attention.*

* The following are some of the more important authors who have contributed original observations on the histology of dysentery: F. GÜNSBURG.—*Die Path. Gewebelehre*, Bd. I, Leipsic, 1845, S. 68—recognized the inflammatory congestion and the outpouring of an exudation containing numerous "inflammation-cells." These especially accumulate beneath the epithelial layer, which breaks down into molecular debris and is thrown off. The inflammation-cells are then transformed into a coherent membrane in which numerous nuclei can be seen. The follicles of the colon are much hypertrophied, and sometimes form branching cul-de-sacs with a common duct. Bd. II. 1848, S. 240, and Tab. IV, Fig. 27. The description is evidently drawn from the diphtheritic process. H. LEBERT—*Physiologie Pathologique*, Paris, 1845, Tome I, p. 216; see also Atlas, Pl. VII, Fig. 2—emphasized the vascular engorgement, capillary rupture, the secretion from the mucous surface of an abundance of mucus mixed with pus, and with epithelium detached from the surface. In severer cases the mucosa now passes into a state of softening and disorganization, which reduces to detritus patches of variable extent. The muscular coat is thus laid bare. Considerable masses of pus, blood and mucus concrete in the form of pseudomembranes, which are often found in the stools. Gangrene, with the destruction and conversion into detritus of large portions of the mucous surface, sometimes occurs. He describes the formation of cicatrices, but gives no particulars with regard to the histology of the process. In his subsequent iconographic work—*Traité d'Anat. Path.*, T. II, Paris, 1861, p. 226—LEBERT repeats this description with some modifications. He now recognizes two kinds of ulcers, follicular and irregular, and observes that the mucous membrane is sometimes covered with false membranes and offers characters "tout à fait diphthéritique." G. GLUGE—*Atlas der Path. Anat.*, Bd II, Jena, 1850. Die Dysenterie—added but little to the descriptions of GÜNSBURG. His microscopical figures, 1ste Lief., Taf. III, Figs. 5–17, are not very satisfactory. The abnormal pushing apart of the follicles of Lieberkühn is, however, clearly shown in Figs. 5, 7, 13 and 14. S. BASCH—*Anat. u. klin. Untersuchungen über Dysenterie*, Virchow's Archiv, Bd. 45, 1869, S. 204 and Taf. XIII. The figures in the plate accompanying this paper are especially noteworthy on account of containing excellent representations of the swollen granular endothelial elements of the submucous connective tissue from both small and large intestines in cases of dysentery, as well as the representations of low vegetable forms, to which reference will be made further on. A. THIERFELDER—*Atlas der Path. Histologie*, Lief. 2, Leipsic, 1873, Taf. XII—has published four carefully drawn lithographic figures of the pathological histology of dysentery. Figs. 3 and 6, being magnified only ten diameters, show very little detail, of course, but Figs. 4 and 5, each magnified 300 diameters, are in many respects noteworthy. The figures are taken from a single case of diphtheritic dysentery. According to THIERFELDER the diphtheritic layer, or, as he calls it, the pseudodiphtheritic membrane, consists of mucus, loosened epithelial elements and the elements of the blood. Fig. 4 represents a section through the mucosa adjoining the diphtheritic layer; it shows the follicles of Lieberkühn pushed apart by greatly distended capillaries which are full of blood corpuscles, red and white; the epithelium of the follicles is in a condition of granular metamorphosis or of fatty degeneration. Fig. 5 is a section through the submucosa, and, besides numerous distended bloodvessels in which both red and white corpuscles are distinctly recognizable, shows several characteristic appearances, viz: 1, The bundles of connective tissue are loosened, and in their interstices [lymph spaces] show numerous lymphoid elements or pus corpuscles, which are most numerous in the portion of the submucous layer nearest the surface; 2, in the same lymph spaces, wherever the swarm of lymphoid elements do not conceal them, larger oval nucleated cells resembling endothelial elements, (Endothelien ungemein ähnliche Zellen;) and 3, a peculiar network composed chiefly of granular debris, but containing also red and white blood corpuscles and the large cellular elements just mentioned. This network our author interprets as formed by hæmorrhage into the lymph spaces, the blood mingling with their contents. THIERFELDER has nothing to say about the condition of the closed follicles in dysentery, but his whole atlas, as far as published, aims merely to reproduce selected specimens, and does not attempt a complete account of any subject; it should be judged from this point of view. I must regard Figs. 4 and 5 as constituting a real addition to our knowledge of the histology of dysentery. The sections represented are from chromic acid preparations. KELSCH (memoir cited on p. 324, *supra*) has severely criticised this contribution of THIERFELDER, but I think without just grounds, [Archives de Physiologie, T. V, 1873, p. 589, note.] In the same article which contained this criticism he admitted that he had himself as yet never examined the histology of a single case of acute dysentery, [p. 574.] This circumstance no doubt explains why he denied so positively the occurrence of the diphtheritic process, and the prominence he gave to a lesion (the invasion of the closed follicles by the glands of Lieberkühn) which, though it often occurs in dysentery, is not essential to it, being rather characteristic of protracted intestinal catarrh. In a subsequent article in the same volume—*Contribution a l'anatomie pathologique de la dysenterie aiguë*, p. 687—KELSCH contributes at length a single case of acute dysentery in which he has studied the histology of the diseased colon with great care, and interprets the appearances found in accordance with the views to which he had committed himself in his earlier papers. But it is unsafe to attempt to build a general scheme of the pathological anatomy of acute dysentery upon the analysis of a single case. Moreover, I must think that the facts of this single case as detailed by KELSCH illustrate very well one phase of the diphtheritic process, namely, that in which the diphtheritic sloughs have completely separated, leaving large areas of the submucous connective tissue exposed as a smooth raw surface, from which here and there project islets of diseased mucous membrane which have escaped complete destruction. The excellent figure which accompanies this paper [Planche XIX] fully supports this view. I may add that notwithstanding the earnestness with which KELSCH insists upon the microscopical examination of the stools, he does not appear to have himself examined the stools of this case, and therefore is unable to speak with knowledge of the characters of the sloughs whose separation left the diseased mucous membrane in the condition he describes. I must censure, too, the uncalled for arrogance with which in this last article he assails all German investigations of the dysenteric process, [p. 706 *et seq.*] The evident bitterness of feeling betrayed in this part of the essay must provoke a smile everywhere but in France; but notwithstanding these faults the papers cited are a valuable contribution to the histology of dysentery, especially in the chronic forms, and the five lithographic plates (one of them colored) by which they are illustrated are praiseworthy additions to the iconography of the subject. I shall have occasion to refer again to

In what may be regarded as the early stages of this process the alterations recognizable in perpendicular sections of the diseased large intestine do not differ materially from what is seen in simple inflammation of the intestinal mucous membrane, except that the surface of the affected part is coated with a thin diphtheritic layer. This layer consists essentially of the blood-fibrin which begins to transude so soon as the inflammatory process attains a certain degree of intensity. If it does not go beyond a moderate degree of hyperæmia, accompanied by a moderate increase in the activity of the normal migration of the white blood corpuscles, an increased activity of the mucus-secretion, characteristic of the healthy intestinal mucous membrane, alone results. As the inflammation becomes more intense the intestinal mucus becomes modified in quality and a more or less abundant transudation of the plasma of the blood is superadded, which is readily recognized by the characteristic reactions of albumen. When a still greater intensity is attained, the fibrin of the blood begins also to transude.

The behavior of the last named ingredient varies in accordance with its quality and the activity with which it is poured out. It may present almost any degree of firmness, from a jelly-like layer of very slight cohesion, readily floating away from the affected parts with the intestinal fluids, to a tough, firmly adherent, well defined layer which fully deserves to be described as a pseudomembrane. The less coherent layers are apt to be displaced during post mortem examinations and so overlooked; or, even if recognized, are apt to separate and be lost during the preparation of sections for microscopical investigation. To secure a view in situ the specimen should be immersed in alcohol to be hardened, before its surface has been injured by handling, or still better, sections should be prepared by freezing, which will give more correct notions of the quality of the fibrin than can be obtained after the action of alcohol. In such sections the fibrin will be found to vary from a slightly granular material to a characteristic meshwork of distinctly marked fibrillæ. It entangles in its substance a larger or smaller number of lymphoid elements, (migrated white blood corpuscles, pus corpuscles,) and often scattered or aggregated red blood corpuscles, which are especially prone to accumulate in the portion of the layer nearest the mucous surface. Moreover, low vegetable forms, as will hereafter be more fully described, can always be recognized, at least in the superficial portions of the layer, from the very first.

Not merely does this fibrinous layer form a coating of variable thickness upon the surface of the mucous membrane, but the interior cavities of the glands of Lieberkühn are more or less distended with a similar material. Sometimes this distension takes place

them further on. See also in this connection the account of the histology of the dysenteric process in HEUBNER'S article on dysentery, in Ziemssen's Cyclopædia, [cited p. 340, *supra*,] and the "Vorläufige Mittheilueg" of ARCADIUS RAJEWSKY—*Ueber Diphtherie des Darmcanals*, Centralblatt für die med. Wiss., 1875, S. 691—who observed the lymph spaces (Safteanälchen) of the submucosa of the dysenteric colon filled with bacteria, [micrococcus,] and made some experiments on the artificial development of dysentery in rabbits, to which I shall refer hereafter. I may also mention here a paper which, although written to illustrate certain points in the pathological anatomy of throat diphtheria, contains interesting details with regard to the diphtheritic process in the mucous membrane of the stomach, that may be advantageously compared with what happens in the colon in dysentery; G. BIZZOZERO—*Beitrage zur path. Anat. der Diphtheritis*, Stricker's Med. Jahrb., 1876, Heft 2, S. 207 and Taf. XIII—saw the diphtheritic process invade the stomach in two cases of throat diphtheria, and observed a subdivision of the pseudomembrane into two layers, a more superficial, consisting of an extremely delicate network, the small meshes of which were filled with "young cells," and here and there contained groups of granules resembling the forms which authors have described as "micrococcus balls," while the deeper layer consisted of the common amorphous substance of the croupous exudation, and in some places was so arranged as to form a coarse network with thick septa, the meshes of which were also filled with young cells. With the exception of this sharp separation of the pseudomembrane into two layers, his description of the changes observed in the mucous membrane of the stomach in these cases closely corresponds with what occurs in the colon in dysentery. Fig. 4 of the plate represents a portion of the mucous membrane of the stomach thus affected. The author also states that in the enlarged solitary follicles, and the thickened Peyer's patches of the small intestine, often observed in cases of diphtheria, he found in the centre of the follicles yellowish easily-separable knots ["diphtheritische Knötchen"] consisting of lymph cells more granular than normal, the spaces between which were filled with fat granules, albuminous granules and large cells containing many small nuclei. Fig. 3 represents a perpendicular section of the ileum magnified 20 diameters, showing such an enlarged follicle. Similar foci were observed in the Malphigian bodies of the spleen and in the mesenteric glands. He adds that in cases of "diphtheritis of the colon" [ulcerous croupous colitis] in children, he has observed similar foci in the follicles of the ileum and the Malphigian bodies of the spleen.

uniformly, and the sections appear as if the false membrane were a secretion of these glands, the accumulation on the surface of the mucous membrane being continuous with that in the glandular cavities. In other cases the lower portions of the glands acquire a cyst-like distension, as though inflammatory swelling had obstructed their orifices, and thus determined the accumulation of the abnormal secretion in their lower portions. In these cases the diphtheritic layer on the surface appears to have been formed by transudation from the capillary network of the mucous surface between the orifices of the intestinal glands. These two conditions of the glands are usually variously commingled, and probably in most cases the diphtheritic layer is derived in part from each of the sources indicated.

Besides this surface exudation, sections of intestine in the condition under consideration exhibit also an increased number of lymphoid elements in the adenoid tissue of the mucosa, in the closed follicles and in the submucous connective tissue, especially that portion of it which lies nearest to the muscle of Brücke, precisely as has been described in simple inflammation of the intestine, but to a still greater degree than usually takes place in acute cases, unless they partake of the diphtheritic characters. By the accumulation of these elements in the adenoid tissue of the mucosa the glands of Lieberkühn are pushed abnormally apart to a degree which varies with the intensity and duration of the process. (See Fig. 7.) By their accumulation in the closed glands more or less enlargement of these organs results, but they seldom attain any very great size unless a protracted catarrhal inflammation has preceded the diphtheritic process. By their accumulation in the submucous connective tissue, taken in connection with other changes in this coat presently to be described, more or less increase in its thickness is determined.

FIG. 7.—Perpendicular section of a dysenteric colon, cut longitudinally. Magnified 110 diameters. The figure is reproduced from a photo-micrograph (Neg. 913, N. S.) of No. 717, Microscopical Section. A. Mucous membrane, showing the glands of Lieberkühn pushed abnormally apart by an accumulation of lymphoid elements in the adenoid layer. On the left and in the middle of the portion shown, several of the follicles have undergone more or less cystic distension. B. The two layers of the muscle of Brücke. C. Submucous connective tissue with an accumulation of new elements, just below the muscle of Brücke. D. Diphtheritic layer (portions of which have been lost) continuous with the contents of some of the glands of Lieberkühn.

In such incipient cases as are under consideration, all these changes, with the exception of the formation of the fibrinous layer, are indistinguishable under the microscope from the similar changes already described as occurring in simple inflammation, and the description given in connection with that process would be substantially applicable here in all its details. All that was there said of the origin of the swarm of lymphoid elements might be repeated here, and the uncertainty expressed with regard to the fate of the columnar epithelium of the mucous surface between the glands, exists also in connection with the diphtheritic process. That during this process the epithelium might be lifted from its attachment, in the form of vesicles, by the exudation and so thrown off, seems

possible enough, and is supported by the occasional observation of columnar epithelial cells either detached or cohering in laminæ in the dysenteric stools. On the other hand, I am satisfied that in perpendicular sections I have several times positively recognized the epithelium in situ beneath the exudation, and I have no doubt that it is often entangled in the diphtheritic layer and shares the fate of the other tissues thus involved.*

The photo-plate facing this page is a reproduction by a mechanical process of a microphotograph representing preparation No. 681, Microscopical Section, Army Medical Museum, which is a perpendicular cut of a portion of colon presenting the slighter degree of the diphtheritic process hitherto described. The cut is one of a series of five from the same intestine, [Nos. 678 to 682, Microscopical Section,] all of which present similar lesions. They are from a boiled preparation stained with yellow aniline and mounted in gum and glycerine. The intestine was obtained from the body of a soldier dead of dysentery in Washington during the year 1864. No further particulars were recorded at the time.

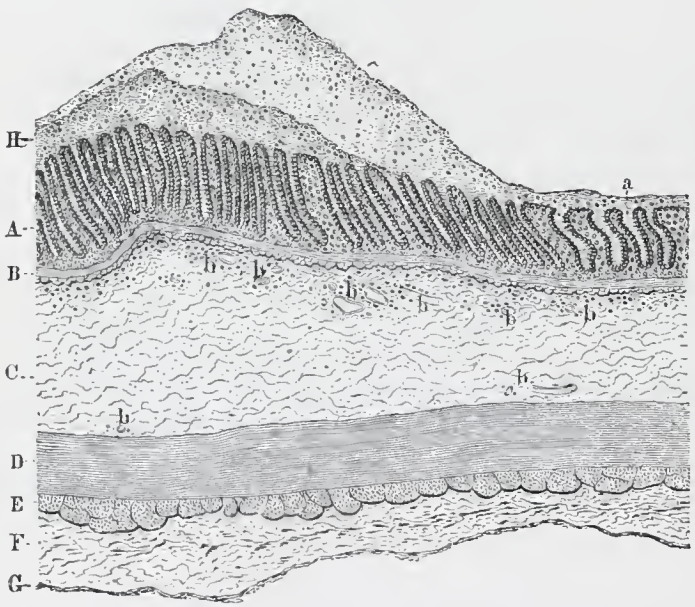



FIG. 8.—Diagram explanatory of the plate facing this page. A. Mucous coat; *a*, *a*, glands of Lieberkühn. B. Muscle of Brücke. C. Submucous connective tissue; *b*, *b*, blood-vessels cut across. D. Circular; E. Longitudinal muscular coat. F. Subperitoneal connective tissue. G. Peritoneal epithelium. H. Diphtheritic layer, which is plainly seen to be continuous with the contents of the glands of Lieberkühn.

The portion of No. 681 exhibited in the plate is magnified 63 diameters by a Beck's $\frac{2}{3}$ objective. The mucous surface of the piece is coated by a diphtheritic layer composed of a granular fibrinous mass entangling numerous lymphoid elements, (pus corpuscles,) which appear in the plate as black dots, and are most abundant in the left hand of the piece near the mucous surface, where they form an opaque mass. The glands of Lieberkühn are distended by the accumulation in their cavities of a substance similar to that composing the diphtheritic layer and continuous with it; as can be seen especially on the right of the plate. They are also pushed pre-

* The transformation of the epithelium in the diphtheritic processes affecting the soft palate and pharynx, the larynx and trachea, has been carefully studied by E. WAGNER—*Die Diphtheritis und der Croup des Rachens und der Luftwege in anatomischer Beziehung*, Archiv der Heilkunde, 1866, S. 481—according to whom the diphtheritic network described in the text as fibrinous, results from a transformation of the epithelial cells of the affected part. These at first swell up from imbibition of plasma; subsequently a network originates in each cell, the processes of which become continuous with those of the network formed in adjoining cells. This transformation he observed especially in the pavement epithelium of the pharynx and soft palate. E. RINDFLEISCH—*Lehrbuch der pathologischen Gewebelehre*, Leipsic, 1873, S. 314—while admitting that he has seen indications of this metamorphosis at the edges of the pseudomembrane in some cases, has expressed doubts as to how far it can be accepted as affording a general interpretation of the formation of the diphtheritic network. NASSILOFF—*Ueber die Diphtheritis*, Virchow's Archiv, Bd. L, 1870, S. 550—was never able to observe the process described by WAGNER, and points out that the network has the chemical reactions of fibrin, a fact which WAGNER himself seems half inclined to admit: "Die netzförmige Substanz der diphtheritischen und der croupösen Auflagerung unterscheidet sich in chemischer Beziehung nicht wesentlich von einander. Sie stehen unter den bekannten chemischen Stoffen dem geronnenen Faserstoff am nächsten." S. 488, *op. cit., supra.* M. BOLDYREW—*Ein Beitrag zur Histiologie des croupösen Processes*, Reichert und Du Bois-Reymond's Archiv für Anat., Physiol., &c., 1872, S. 75, also Taf. II—has critically examined the diphtheritic process in the larynx and trachea to ascertain whether WAGNER's view is correct, and arrived at the conclusion that it is not, and that the network is simply fibrinous. He also states that in this situation the ciliated epithelium is thrown off during the catarrhal stage which precedes the formation of the false membrane. F. STEUDENER—*Zur Histologie des Croup im Larynx und der Trachea*, Virchow's Archiv, Bd. LIV 1872, S. 500—from a similar investigation arrived at like results. In this connection I may refer, in corroboration of the statement in the text, that "I have several times positively recognized the epithelium in situ beneath the exudation," to Taf. IV, Fig. 13, illustrative of the paper of OERTEL—*Experimentelle Untersuchungen über Diphtherie*, Deutsches Archiv für klinische Medicin, Bd. VIII, 1871, S. 242—which represents a perpendicular section of the diphtheritic mucous membrane of the trachea of a rabbit. In this figure the fibrinous diphtheritic layer reposes on the surface of the cylindrical epithelium, which is infiltrated, as well as the subepithelial tissue, with lymphoid elements. The diphtheritic layer is also infiltrated with micrococci and large cells. The latter I do not recognize; with this exception the picture is not unlike what I have many times seen in sections of the intestine.

*Heliotype.* *James R. Osgood & Co., Boston.*

PERPENDICULAR SECTION OF COLON

COATED WITH PSEUDOMEMBRANE. Magnified 63 Diameters.

PHOTO-MICROGRAPH BY ASSISTANT SURGEON J. J. WOODWARD, U. S. A.

From No. 681. MICROSCOPICAL SECTION.

ternaturally apart by the accumulation of lymphoid elements in the adenoid tissue. The details of this change, and the anatomy of the muscle of Brücke, can readily be made out in the original preparation, but being rather too deeply stained with yellow aniline these parts, as well as the muscular coat of the intestine, were so opaque to the actinic rays that they appear in the photograph as black masses almost without detail. The submucous connective tissue is but little thickened, its tissue elements nearly normal; but between them a considerable number of lymphoid elements are infiltrated, and appear in the plate as black dots. The other sections of the same series exhibit very similar conditions, besides which one or more somewhat enlarged solitary follicles can be seen in each, and in each there is a small ulcer going about half way through the mucous coat, caused by the separation of a superficial slough.* This series represents a very early stage of the diphtheritic process, such as can usually be seen near the spreading margin of the lesion in cases of acute diphtheritic dysentery that have not been preceded by protracted catarrhal inflammation.

In such conditions as have been described there appears to be no anatomical difficulty in the way of resolution. We can readily understand that, should the disease take a favorable course, the abnormal elements might find their way back again into the blood from whence they came, either directly or indirectly, through the lymphatic circulation; the coagulated fibrin on the surface might be swept away into the intestinal canal on the renewal of the normal secretion of the tubular glands, and the mucous membrane would thus entirely regain its normal character.

Certain remarkable changes, consisting essentially in the invasion of the closed follicles by the adjoining glands of Lieberkühn, are sometimes observed even in these incipient diphtheritic cases as well as those of a more intense character. These changes have already been alluded to† as occurring in protracted cases of simple inflammation, and, so far as I have been able to ascertain, are only observed in diphtheritic dysentery when the diphtheritic process has supervened upon a protracted catarrhal inflammation of the mucous membrane. I regard these lesions, therefore, as belonging properly to chronic catarrh; certainly I have frequently failed to find any trace of them, in intestines exhibiting the most intense diphtheritic lesions, when the dysenteric attack has not been preceded by a somewhat protracted flux; but this happens so often that they are very frequently encountered in diphtheritic intestines, so that a picture of the diphtheritic process would hardly be complete without them. I therefore present a brief description in this place.

It has been already mentioned‡ that the apices of the closed follicles of the large intestine penetrate the muscle of Brücke and extend between the glands of Lieberkühn, in the form of cones, almost or quite to the epithelial surface of the intestine; and that the portion of the parenchyma of the closed glands which lies thus in the mucous membrane is not bounded by any distinct capsule, but is directly continuous with the adenoid tissue of the mucosa. These anatomical relations favor the occurrence of the anomaly about to be described; for while the cyst-like distension of the lower portion of the obstructed glands of Lieberkühn is elsewhere limited by the presence of the muscle of Brücke, through which, so far as I have been able to observe, the enlarged glands never make their way,

* In the *Catalogue of the Microscopical Section of the Army Medical Museum*, prepared by Brevet Maj. D. CURTIS, Asst. Surg., U. S. A., Washington, 1867, p. 60, the shallow ulcers in these specimens alone are described, but no mention is made of the diphtheritic layer. It is also stated that the "muscular layers have not been preserved in these sections," which is true of large parts of them, but not of all, as, for example, the part represented in the plate.

† See p. 328, *supra*. ‡ *Supra*, p. 319.

those which lie nearest to the closed follicles find no obstacle to their extension in the diseased parenchyma of these organs, in which the accumulation of new elements seems to be associated with considerable loss of cohesion in the reticulum of the parenchyma.

So far as the glands of Lieberkühn are concerned the process is by no means a passive one. Whether the accumulation of the abnormal secretion in their interiors serves as the stimulus, or this is supplied by the inflammatory condition itself, a genuine hyperplasia of the epithelial lining of the glands results. The glands are not merely distended into bag-like cysts; they shoot out branching buds, which grow into the substance of the adjacent closed follicles, until ultimately several of the glands adjoining each follicle have acquired racemose branches, that lie in the space formerly occupied by the parenchyma of the follicle, the greater portion of which is crowded aside, or, an ulcer having been formed, floats away as pus, to make room for the new growth. Subsequently the branching tubes often undergo cyst-like distension, and these dilatations coalescing may form cysts of considerable size, ($\frac{1}{20}$th to $\frac{1}{4}$th of an inch or more in diameter,) but they always retain more or less of the characteristic lining of columnar epithelium which exists in the glands of Lieberkühn, and the presence of which in the most aberrant varieties of these cystic forms betrays their origin.

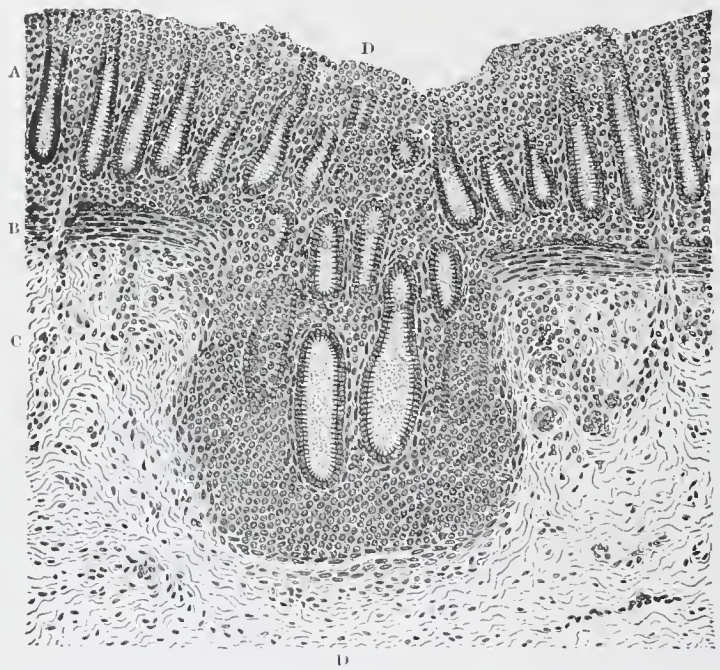



FIG. 9.—Perpendicular section of the colon of a child, cut longitudinally. Magnified 110 diameters by Powell & Lealand's ½-inch objective. Copied from a photo-micrograph (Neg. 924, N. S.) of No. 6103, Microscopical Section. A. Mucous membrane, showing the glands of Lieberkühn pushed apart by the swarm of lymphoid elements in the adenoid tissue. B. Muscle of Brücke. C. Submucous connective tissue, with numerous lymphoid elements near the muscle of Brücke. In the centre of the piece (between D and D) is an enlarged solitary follicle in which several cystic forms, described in the text, appear. The slit-like fissure just below the enlarged gland is a lymph sinus.

Figure 9 represents an early stage of the process under consideration, as it may often be observed in a smart intestinal catarrh uncomplicated by the diphtheritic process and not accompanied by dysenteric symptoms during life. The specimen, from a photo-micrograph of which the figure is copied, is a perpendicular section of the intestine of a mulatto child 18 months old, who died of intestinal catarrh (cholera infantum) in 1873. Some further particulars with regard to the case will be given hereafter when the histology of follicular ulceration comes to be discussed. In such sections the branching dilated tubes which have invaded the solitary follicles appear as isolated oval cysts lined by the characteristic columnar epithelium.

This singular lesion was first accurately described and figured by Kelsch,* to whom belongs the credit of suggesting the true explanation of the method in which it is produced. He erred, however, in supposing it to be peculiar to dysentery. It is in fact essentially a phenomenon of catarrhal inflammation. In protracted catarrhs of the large intestine some

* See note † to p. 324, *supra*.

degree of the process is very frequently present, and it is precisely in some of these cases that its most exquisite development is attained, the adjacent cystic branches opening into each other and their contents accumulating until compound cysts ⅛th to ¼th of an inch or more in diameter are produced, as will be described hereafter.

But since diphtheritic inflammation frequently supervenes upon a previously existing intestinal catarrh, curious cystic forms, having their origin in the process just described, are often encountered in perpendicular sections of the diphtheritic colon. A common variety of these cystic forms is exhibited in Fig. 10, which represents a portion of a perpendicular section of the colon depicted in the plate facing page 412.* The upper portion of the figure represents the diphtheritic layer which is immediately continuous with the submucous connective tissue. All traces of the muscle of Brücke or of the glandular layer have been destroyed,† with the exception of the branching communicating cysts seen near the centre of the figure. These appear as isolated forms in each section, though by an examination of several parallel ones it is easy to see that they communicate with each other. The well known columnar epithelium of the glands of Lieberkühn forms a complete lining to each cyst. Such cysts may be found associated with any of the phases of the diphtheritic process.

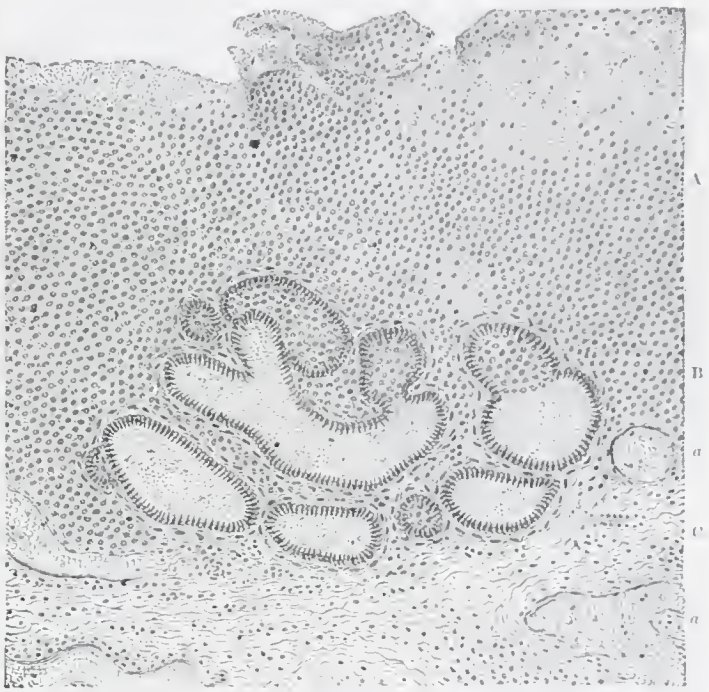



FIG. 10.—Perpendicular section of a diphtheritic colon. Magnified 110 diameters. Copied from a photo-micrograph (Neg. 928, N. S.) of No. 7260, Microscopical Section. A. Diphtheritic layer which is immediately continuous with the submucous connective tissue C. Opposite B, near the middle of the figure, are the cysts described in the text. *a, a.* Small veins crowded with blood corpuscles. *b, b.* Arteries in the submucous connective tissue.

In the graver forms of the diphtheritic process we encounter not only a more abundant exudation upon the mucous surface, but a denser swarm of lymphoid elements in the adenoid tissue of the mucous membrane and in the submucous connective tissue. In sections the capillaries of the mucosa are found distended with blood, the corpuscles, both white and red, being distinctly recognizable in preparations hardened in alcohol and mounted in Canada balsam. Capillary hæmorrhages are often observed just beneath the epithelial surface, that is, precisely where the capillaries form their rich plexus around the orifices of the glands of Lieberkühn; the red corpuscles are found heaped together in countless multitudes, and form hæmorrhagic areas of considerable size in the superficial parts of the mucous membrane and in the deeper parts of the diphtheritic layer.

* No. 360, Med. Sect. There is in this case no detailed previous history, and consequently no information on record with regard to the duration of the catarrhal affection, which probably preceded the dysentery.

† This disappearance of the glandular layer and the apparent substitution for it of a diphtheritic layer, continuous with the submucous connective tissue, led me, in my earlier studies of this process, into the mistake of supposing the cell-forms in the diphtheritic layer to proceed from the proliferation of the elements of the tissues replaced—see, especially, my paper *On the use of aniline in histological researches*, &c., The Amer. Jour. of the Med. Sci., Jan., 1865 p. 113—a theoretical error which I have long since abandoned.

In the superficial portions of the submucous connective tissue the lymphoid elements obscure the muscle of Brücke and accumulate about the closed glands until their limits can no longer be recognized. In proportion to the increasing severity of the case, the area in which the swarm is so dense as to obscure or conceal all other elements, becomes more extensive until the whole submucous connective tissue is thus infiltrated as far down as the surface of the muscular coat of the intestine. Along with the lymphoid elements a delicate granular material, very similar in character to the exudation on the mucous surface, now makes its appearance everywhere between the new elements, especially in the lymph spaces of the submucous connective tissue, adding to the obscurity of the picture and justifying the belief that a fibrinous exudation similar to that which had formed on the surface of the mucous membrane has coagulated in the interstices of the tissues.

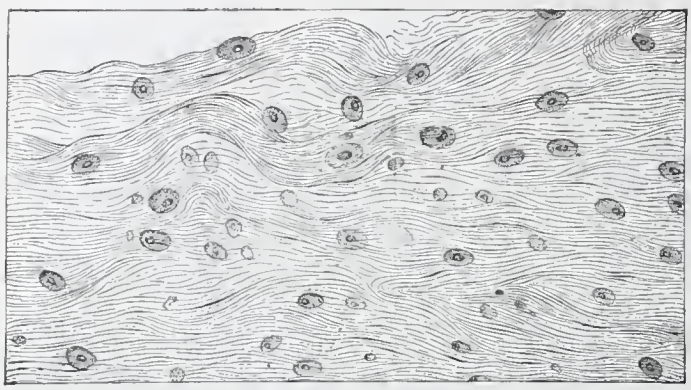


FIG. 11.—Submucous connective tissue of the colon in dysentery. Magnified 300 diameters. Copied from a photo-micrograph (Neg. 945, N. S.) of No. 7236, Microscopical Section. Lying on or between the connective-tissue bundles are two kinds of granular cells. The smaller ones without nuclei are lymphoid elements; the larger nucleated ones are the transformed parenchyma cells described in the text.

Meanwhile other changes are taking place in the submucous connective tissue. These are most readily recognized in those portions in which the structural details are not obscured by the density of the lymphoid swarm. Here the texture of the fibrillated matrix of the submucous connective tissue appears to be loosened as if by œdema, the lymph spaces are larger than normal, and the stellate connective-tissue corpuscles are more or less entirely replaced by oval nucleated granular cells, which vary from $\frac{1}{2000}$th of an inch, or even less, to $\frac{1}{1500}$th or even $\frac{1}{1000}$th of an inch in long diameter, which sometimes adhere to the walls of the lymph spaces, (*i. e.*, to the surface of the connective-tissue bundles,) and sometimes lie free in their cavities. Figure 11 represents the condition in question as seen in a perpendicular section of a portion of the colon in case 266. The connective-tissue bundles were pretty widely parted, but as other bundles form the background of these clefts, the artist has attempted to indicate the portions beyond the focal plane by more delicate and widely separated lines, in which he has not been wholly successful. The larger nucleated cells adhering to the surface of the bundles in focus, or lying between them, are the transformed parenchyma cells; the smaller ones are lymphoid corpuscles. When a section through a portion of the submucous connective tissue thus affected is stained with carmine and teased with needles, single connective-tissue bundles can often be isolated, to the surface of which the large granular cells adhere in more or less continuous rows, as in Figure 12.

FIG. 12.—Portion of the submucous connective tissue of the colon in dysentery, after teasing with needles. Magnified 300 diameters. Copied from a photo-micrograph (Neg. 944, N. S.) of an extemporaneous preparation from No. 163, Medical Section. The central connective-tissue bundle shows the row of granular cells described in the text.

The condition just described is much more common in the large intestine than in the small; but undoubtedly occurs at times in the latter situation. This is strikingly illustrated by Fig. 13, which represents a portion of a perpendicular cut of No. 284, Medical Section. The specimen is a portion of small intestine* greatly thickened, and presenting a number of deep, irregular ulcers, some of which penetrate to the peritoneal coat. The patient died of so-called "diarrhœa" during the winter of 1862 in Douglas hospital, Washington, D. C., and the specimen was presented by Assistant Surgeon (now Surgeon) Warren Webster, U. S. A. No history of the case has been preserved. In this piece the mucous membrane between the ulcers was infiltrated with lymphoid elements, but the swollen villi projected freely on its surface, and no pseudomembrane was anywhere found. The submucous connective tissue was greatly thickened, (to nearly $\frac{1}{10}$th of an inch from the muscular coat to the surface,) and wherever the appearances were not obscured by the lymphoid swarm, the connective-tissue corpuscles had disappeared and were replaced by granular nucleated cells somewhat smaller and rounder than those usually seen in the condition described above as existing in the colon. Moreover, in some parts of the submucosa the lymph spaces were infiltrated by larger or smaller groups of minute granules which, from their behavior towards reagents, were undoubtedly micrococcus. The colon of this subject, which probably presented in a marked degree the lesions of diphtheritic dysentery, was unfortunately not preserved.

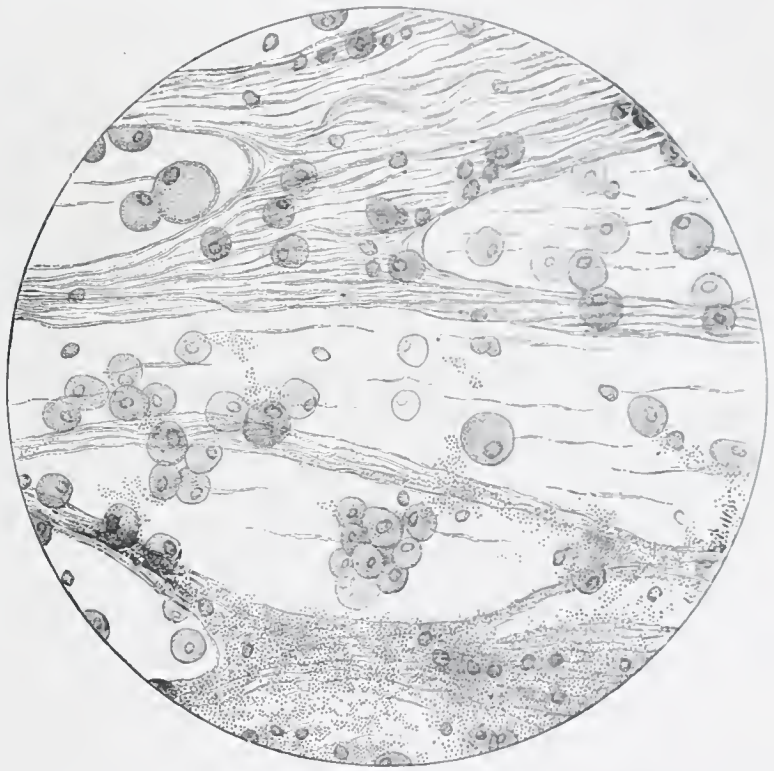


FIG. 13.—Portion of a perpendicular section through the submucous connective tissue of the ileum in a case of dysentery. Magnified 480 diameters. Copied from a photo-micrograph (Neg. 952, N. S.) of No. 7256, Microscopical Section. The lymph spaces are dilated, and lying free in these and adhering to their walls are numerous rounded, granular, nucleated cells, and also a number of smaller granular bodies, (lymphoid elements.) The granules in the lower portion of the piece are micrococcus groups.

The presence of the large granular cells just described in the inflamed submucous connective tissue and the simultaneous disappearance of the normal connective-tissue corpuscles will be best understood if these latter bodies be regarded as endothelial elements,† and it be supposed that they become swollen, granular and lose their adhesion to the fibrillated matrix during the inflammatory process. Basch‡ has described and figured these granular cells in the submucosa of both small and large intestine of dysenteric subjects dissected by him in Mexico. He correctly interpreted them as metamorphosed connective-tissue corpuscles. They have also been figured by Thierfelder,§ who mentions their resemblance to endothelial elements.

* In the *Catalogue of the Medical Section of the U. S. Army Medical Museum*, Washington, 1867, p. 80, this specimen, by some accident, has been described as a "portion of colon."

† See p. 319, *supra*. ‡ *Op. cit.*, p. 461, *supra*. § *Op. cit.*, p. 461, *supra*.

According to Heubner,* this transformation of the connective-tissue cells occurs only in diphtheritic, and never in catarrhal dysentery, an opinion with which I cannot agree. On the one hand I have not only observed it in diphtheritic dysentery in parts of the intestine which the diphtheritic process had not yet reached, but also, especially in old chronic catarrhs with great thickening of the submucosa and follicular ulceration, in colons which nowhere manifested any trace of the diphtheritic process. On the other hand, it is often imperfectly seen, or is altogether absent, in those cases in which the diphtheritic process, having developed without a previous catarrh of any long duration, proves speedily fatal. I cannot, therefore, regard it as characteristic of the diphtheritic process, though it very often accompanies it.

The bloodvessels of the affected submucosa, especially the small veins, are greatly engorged with blood and their walls are often infiltrated by the lymphoid swarm; they can be recognized in sections mounted in Canada balsam not merely by the characteristic tissues of their coats, but very often by the multitude of red corpuscles, which are more or less perfectly preserved in their interiors, and among which a certain number of white corpuscles can always be recognized. In well preserved specimens the outlines of the red corpuscles can be perfectly defined with any good immersion lens; but when post mortem changes have progressed somewhat this is less readily done, and often the capabilities of the best optical instruments are taxed to the uttermost to make out the form of the elements which compose the coagula. I am satisfied, not merely by the study of the numerous preparations made at the Museum, but by my examination of his own admirable drawings, that a part at least of the objects which Kelsch† has described and figured as dilated lymphatic vessels filled with coagulated fibrin entangling lymph cells in its reticulum, were really veins containing blood-clots in the state of partial decomposition just alluded to. When the bloodvessels contain no coagula their endothelial lining is very often found detached and lying free in the lumen, either in consequence of post mortem changes or of the mechanical violence sustained in cutting the sections. Moreover, especially in those cases in which the diphtheritic process has supervened upon a chronic catarrh, the internal coat, or both the internal and middle coats, of the small arteries are sometimes found in a state of amyloid degeneration.‡

As for the lymphatic vessels, their endothelium appears to share in the granular swelling that affects the endothelium of the lymph spaces with which they are continuous, and occasionally they are found distended with fibrin and lymph corpuscles; but any such

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* *Dysenterie*, in Ziemssen's Handbuch, Bd. II, Th. I, Leipsic, 1874, S. 525.

† KELSCH—memoir cited *supra*, p. 324, Archives de Physiol., T. V, 1873, p. 583—remarks: "Il y a, en outre, dans cette tunique celluleuse, une altération profonde des vaisseaux lymphatiques et sanguins. Les premiers sont énormément dilatés. Ce fait est si général et si accentué, qu'il frappe tout d'abord quand on examine la celluleuse même à un faible grossissement." He describes these dilated lymphatic vessels as sometimes filled with a fibrinous reticulum, in the meshes of which are cells analogous to those of lymph. In other cases the vessel is plugged with large and small nucleated cells, which are more or less polygonal from mutual pressure. Now, neither in the three admirable colored figures (Pl. I, Figs. 1, 2, 3) which accompany his memoir in the *Comptes rendus de la Soc. de Biologie*, (cited *supra* p. 324,) nor in the four beautiful figures (Pl. XI, Figs. 1, 2, Pl. XII, Figs. 3, 4) which illustrate his first paper in the Archives, is there any reference to these dilated lymphatics, although the enlarged bloodvessels of the submucosa are figured and described. It is only in Figs. 1 and 2 of Pl. XIII that they at length make their appearance; and surely in Fig. 1 the forms lettered *e*, *e*, which are described as "vaisseaux lymphatiques dilatés, remplis de cellules et de fibrine," are merely veins containing coagula. In Fig. 2 the same interpretation is demanded by the upper vessel marked *n*, while a portion at least of the other appearances, explained as lymphatic vessels with their endothelium detached, are not to be distinguished from veins in the same condition. I do not wish to be understood as denying that the lymphatic vessels in the submucosa of the dysenteric intestine are sometimes dilated and filled with fibrin, or that their endothelium shares in the process which we have seen affects the endothelium of the lymph spaces, (connective-tissue corpuscles,) but merely express the opinion that a part of the picture which KELSCH has drawn results from his mistaking veins for lymphatics. I may add that the dark network in Fig. 1, Pl. XIII, which is lettered *h*, and described as "exsudat fibrineux avec globules blancs déposés entre les faisceaux de tissu conjonctif," is, I presume, of the same nature as the dark network figured by THIERFELDER, (see p. 461, *supra*,) and with the micrococcus network which I shall describe a little further on.

‡ See p. 333, *supra*. This condition is I presume the same observed by RAJEWSKY—*loc. cit.*, p. 462, *supra*—who describes it as a hyaline metamorphosis. "Zu gleicher Zeit erscheint in dem veränderten Gewebe eine hyaline Metamorphose der Blutgefässe."

general dilatation as Kelsch has described I have been unable to recognize. Nor have I been able to make out, in a satisfactory way, the condition of the nerves of the diseased intestine. When it is remembered how difficult it is to determine the course of the nerves in the normal human intestine if the dissection be postponed for a few hours after death, it will not seem surprising that the attempts hitherto made to examine into the condition of the nerves in the dysenteric intestine have not as yet given definite results.

For the purpose of illustrating the appearances presented by perpendicular sections of the colon in the more advanced stage of the diphtheritic process just described, the steel engraving facing page 472 has been prepared. It is a reproduction of a photo-micrograph of a duplicate perpendicular cut from the same piece of colon as Nos. 729 to 731, Microscopical Section, Army Medical Museum, and represents some of the conditions just described as seen with a power of twelve diameters. The mucous surface of the piece represented is coated with the diphtheritic layer very much as in the plate facing page 464. In the mucous membrane, which is considerably thickened, the glands of Lieberkühn are pushed apart by the accumulation of lymphoid elements in the adenoid tissue, and their upper portions are completely obscured by this cellular mass; but they have not undergone any cystic change. At several points accidental breaks in this layer have been made by the razor in preparing the sections. The submucous connective tissue is swollen to $\frac{1}{12}$th of an inch in thickness. The infiltrating lymphoid elements, which with the low power used appear as mere dots, are most abundant just below the muscle of Brücke, except on the right of the piece represented in the plate, where the whole submucous layer is infiltrated. The great thickness of the longitudinal muscular coat, especially on the right of the picture, results from the circumstance that the section passes here through one of the *ligamenta coli*.

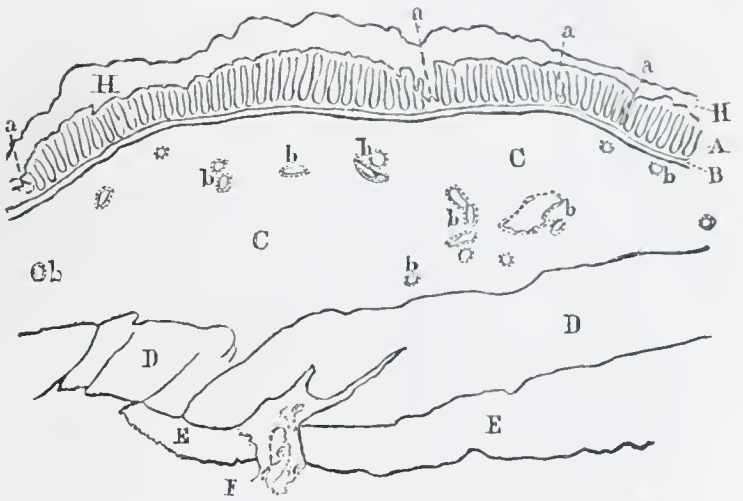



FIG. 14.—Diagram explanatory of the plate facing page 472, representing a perpendicular section of a diphtheritic colon cut transversely. A. Mucous membrane, in which *a*, *a*, *a*, *a*, are rents made by the razor. B. Muscle of Brücke. C. Thickened submucous connective tissue. *b*, *b*, *b*, *b*. Bloodvessels cut across. D. Circular, E. Longitudinal, muscular coat of the intestine. F. Point of entrance of bloodvessels. H. Diphtheritic layer.

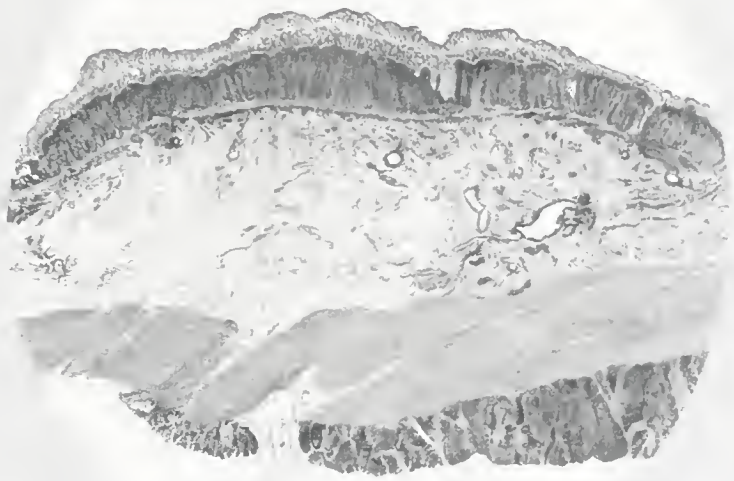
The preparation represented by this plate, together with Nos. 729–731, Microscopical Section, which are parallel cuts from the same boiled piece, were mounted in the fall of 1864 in camphor-water acidulated with acetic acid; they were stained with aniline, and have long since perished by molecular changes; the piece of intestine was selected from the colon, a portion of which is represented in the chromo-plate facing page 442, and has been preserved in the Museum, (No. 360, Medical Section.) Long after these preparations had spoiled I had a series of cuts made from the alcoholic preparation which, after staining with carmine and mounting in Canada balsam, show many points in the minute anatomy of the piece even better than the original preparations did when fresh. (These are Nos. 7259–63, Microscopical Section.) Figure 10, on page 467, was drawn from a photo-micro-

graph of one of these cuts; and the next illustration is taken from another part of the same. Figure 15 represents a portion of the infiltrated submucous connective tissue of the colon, the place selected being a point where the section passes through a small artery and vein. The intima of the artery is in a state of glassy swelling, (amyloid degeneration;) its lumen contains a few red and white blood corpuscles and some granular fibrin. The vein is nearly filled with a blood-clot, the red corpuscles of which can be distinctly made out, with white corpuscles scattered here and there. The connective tissue is infiltrated with numerous lymphoid elements; the endothelial cells of its lymph spaces are slightly swollen, their nuclei appearing rather large and oval; but they have not attained to an advanced degree of the transformation described and figured in page 468.

FIG. 15.—Portion of a perpendicular section through the submucous connective tissue of the colon in a case of dysentery. Magnified 175 diameters by Powell & Lealand's immersion $\frac{1}{4}$th. Copied from a photo-micrograph (Neg. 922, N. S.) of No. 7260, Microscopical Section. The nearly circular vessel to the left and below the centre of the piece is a small artery. The larger elliptical form to the right is a vein. Several smaller vessels are cut across in other parts of the piece. The connective tissue throughout is infiltrated with lymphoid elements.

Sooner or later during the progress of the alterations hitherto considered sloughing sets in. This is the characteristic feature of the diphtheritic process, and completes the similitude between diphtheria in the pharynx and the lesions of dysentery. The stage at which sloughing begins varies greatly in different cases. In some, the tissues retain their vitality until the whole mucosa and submucosa are stuffed with lymphoid elements, and thus transformed into a yellowish opaque mass, coated on the surface with a dense yellow pseudomembrane. In others, at a very early period in the disease, the affected parts become considerably swollen by the accumulation in their substance of an exudation rich in albumen, but containing only a moderate quantity of fibrin and a comparatively moderate number of lymphoid elements; and in this condition sloughing may set in as rapidly and destructively as occurs after the tissues have been thoroughly stuffed with lymphoid cells. In this class of cases the process somewhat resembles œdematous erysipelas of the skin, to which indeed it has been compared by Rollo and Wedekind.* But between the most extreme cases of this kind, and those in which the lymphoid elements become most abundant before sloughing occurs, every transition may be observed, so that I cannot but regard both varieties as merely different phases or degrees of one and the same process.

* Consult ROKITANSKY—*Der dysenterische Prozess*, &c., Oest. Med. Jahrb., Bd. XX, 1839, S. 81; also G. F. v. WEDEKIND—*Ueber die Ruhr*, Frankfurt a. Main, 1811, S. 20.



The accumulation of new elements in the connective tissue just beneath the mucous layer, which derives its supply of bloodvessels from the vascular plexus that exists in this very situation, has been held in many quarters to afford a sufficient explanation of the sloughing that takes place. It has been supposed that this accumulation interferes mechanically with the circulation in that membrane, and thus cutting off its nutritive supply causes it to perish.* No doubt this explanation has a certain amount of validity in some cases, but it affords no solution of the extensive sloughing which sometimes occurs before any considerable accumulation of new elements has taken place. Whatever its cause, the sloughing may be limited to the superficial parts of the mucosa, or may involve the whole of it, or more or less of the submucous connective tissue may also be implicated. The conditions limiting the extent and depth of the sloughs are not always easily to be determined. When parts of the submucous tissue are stuffed with new elements it is in some cases very clearly seen that the extent of the sloughing appears to coincide with the area of infiltration, if not to be determined by it; but when this infiltration is scanty it is not easy to make out why some portions of the swollen œdematous tissue perish while others retain their vitality.

The tissue-necrosis, whatever may be its extent, is speedily followed by putrefactive changes in the dead parts. These changes may be compared to those which occur in a gangrenous limb, only in the case of the intestine the tissue involved is softer, moister, and therefore more putrescible; and, moreover, it is maintained at very nearly the temperature of the living body, a circumstance which favors the rapidity of the process. The occurrence of putrefaction is manifested microscopically by a granular metamorphosis of all the tissue elements involved, in consequence of which they are speedily converted into a mass of unrecognizable molecular debris. Only when the sloughs separate, before sufficient time is afforded for the completion of this process, can any characteristic structural details be recognized in them. This circumstance explains the difficulty often experienced in detecting structure in the sloughs passed by stool; but fortunately for diagnostic purposes the process generally occurs quite irregularly, so that patches which have undergone comparatively little change are frequently detached, in consequence of the more advanced metamorphosis on their borders, and find their way into the stools.

From the moment that these putrefactive changes begin to occur in the sloughs, the characteristic low vegetable forms that arise whenever nitrogenous matters undergo decomposition rapidly invade them. The diphtheritic sloughs are a fertile soil for the growth of these humble organisms, which are already present in the contents of the diseased, indeed even of the normal intestinal canal, in countless myriads.† It is not surprising, therefore, that these forms should be found not merely on the surface of the eschars, but throughout the whole of their putrid substance; as well as in the coagula filling any bloodvessels which lie in the eschars, or even in coagula, continuous with these, extending far into the adjacent still living tissues. Spherical bodies of extreme minuteness, (micrococcus,) either scattered irregularly, grouped in masses or associated as beaded filaments, are the forms most generally encountered in all parts of the sloughs. Rod-like forms (baccilli, bacteria) are also found to some extent, but as a rule only in the most superficial parts, or in cavities communicating with the surface.

* This suggestion is very clearly presented, for example, by KELSCH, Archives de Physiol., T. V, 1873, p. 579; see note † to p. 324, *supra*.
† See pp. 272 and 367, *supra*.

Figure 16 exhibits both kinds of these forms as they are often seen in a slough involving the mucous membrane. It is copied from a photo-micrograph of a perpendicular section of a portion of the colon of case 587. At the place selected for the photograph the section passes through a slough which is still adherent to the infiltrated submucosa. In this slough there are a number of parallel cylindrical cavities that correspond in size and position to the tubular glands of the intestine which, throughout the sloughs, have quite perished leaving no trace of their structure behind. One of these cylindrical cavities crosses the field obliquely; in its lumen, which communicates with the cavity of the intestine, there are several micrococcus masses and a number of scattered rod-like forms. The rest of the field is occupied by micrococcus and granular tissue-debris; near the margins of the central cavity, however, a few rod-like forms can be seen.

FIG. 16. Portion of a perpendicular section through the eschar in a case of diphtheritic dysentery. Magnified 950 diameters by Powell & Lealand's $\frac{1}{12}$th immersion. Copied from a photo-micrograph (Neg. 932, N. S.) of No. 7223, Microscopical Section, which is a cut of No. 72, Medical Section. The field is crossed obliquely by a cavity, (the former site of one of the glands of Lieberkühn.) in which are several micrococcus groups and a number of rod-like forms. The rest of the field is occupied with micrococcus, with a few rod like elements near the edges of the central cavity.

Not merely do micrococcus presenting the characters represented in this figure develop in multitudes in the dead eschar and in coagula contained in the bloodvessels leading from it, but, before the slough separates from the adjacent still living tissue, they find their way from the dead into the living parts. In this invasion they follow the paths of least resistance, that is, almost always the lymph passages, under which head, besides the lymphatic vessels, the irregular spaces between the connective-tissue bundles of the submucosa are of course to be included. In perpendicular sections of diphtheritic colons this invading swarm can almost always be recognized, even with quite low powers, (20 diameters or less,) as an opaque, brown network of anastomosing forms, the true nature of which can readily be detected by the use of reagents. These anastomosing forms extend from the diphtheritic sloughs into the submucous connective tissue, in which they spread for long distances in all directions. The lymph passages being larger and more permeable in the lower half of the submucous connective tissue than in the upper, it is in this portion especially that the network is coarse and readily seen; moreover, in the upper portion of the submucosa its finer branches are obscured by the dense swarm of lymphoid elements, which probably offer also a mechanical obstacle to the penetration of this portion of the membrane, its lymph spaces being already pretty well obstructed by them.

This micrococcus network, as I propose to call the characteristic appearance just described, is well shown in Figure 17, which is copied from a photo-micrograph of a portion of another perpendicular section of the colon of case 587. In all the cuts made from the colon of this case the network was prominently developed in the lower portion of the submucosa. This condition was also observed in sections cut from a number of other specimens belonging to the cases enumerated on page 453, as well as in some from cases, which will be discussed hereafter, in which diphtheritic dysentery supervened upon chronic follicular ulceration of the colon.

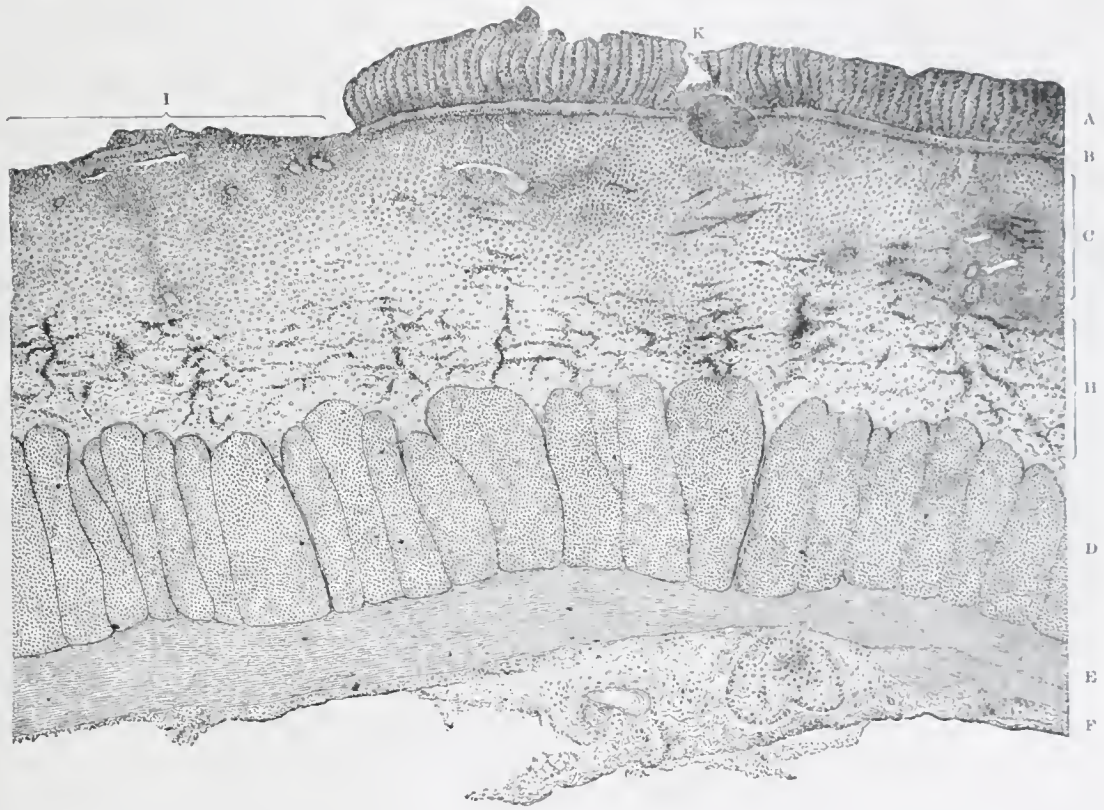



FIG. 17.—Perpendicular section of a diphtheritic colon cut longitudinally. Magnified 22 diameters. Copied from a photo-micrograph (Neg. 939, N. S.) of No. 7224, Microscopical Section, which is a cut of No. 72, Medical Section. A. Mucous membrane, a part of which, corresponding to I, has been removed by the separation of a slough. At K, an enlarged solitary follicle. The pseudomembrane layer, which coated the surface of the mucous membrane, has for the most part broken away; on the left of K a little of it still remains. B. Muscle of Brücke. C. Upper portion of the submucous connective tissue infiltrated with lymphoid elements, the size of which is considerably exaggerated in the figure. H. Lower portion of the submucous connective tissue; the dark branching figures constitute the micrococcus network. D. Circular muscular coat of the intestine. E. Longitudinal muscular coat. F. Subperitoneal connective tissue.

When this micrococcus network is examined with a higher power (300 to 500 diameters or more) it is seen to consist in part of mere heaps of micrococcus spheres without any recognizable arrangement; but whenever the masses are not too bulky to be transparent it will be seen that a considerable portion of the spherules are arranged in rows, forming beaded chains, in which the individual elements are so small that unless objectives of the best defining power are employed the chains resemble fine continuous threads. The network will be observed to occupy the clefts between the connective-tissue bundles (*i. e.*, the lymph spaces) and often to entangle in its substance the granular nucleated cells, explained on page 468 to be the swollen endothelial cells of the lymph spaces. Sometimes, also, considerable numbers of lymphoid elements are thus entangled. The condition thus produced is so complex that it is only in its incipient stages that it is adapted to pictorial representation.

Figure 18 is copied from a photo-micrograph taken from near the margin of an area of the submucous connective tissue of the colon which was occupied by the micrococcus network. Here some of its branches were very delicate, and swollen endothelial elements occupy nodal points. The cut gives a good idea of the early stages of the process as seen with a power of 475 diameters.

The micrococcus network just described has been admirably figured by Thierfelder,* who, however, entirely misconceived its nature, supposing the network to be caused by an infiltration of the lymph spaces with blood, which subsequently breaks up into granular detritus. This possibility is, however, promptly negatived by the use of suitable reagents; the micrococcus network resists the action of strong solutions of caustic potash or soda, as well as acetic acid, alcohol and ether. By the use of these reagents, also, this network is promptly distinguished from the protoplasmic and fatty granules, set free during the putrefactive metamorphosis of the tissues, which optically appear very similar. I do not doubt that the finely granular infiltration which Basch† described and figured as occurring in the submucosa during the advanced

FIG. 18.—Perpendicular section of a dysenteric colon, showing the micrococcus network in the submucosa. Magnified 475 diameters. Copied from a photo-micrograph (Neg. 947, N. S.) of No. 7269, Microscopical Section, which is a cut of No. 462, Medical Section. The specimen is from case 318.

* From the provisional account given by ARCADIUS RAJEWSKY *(op. cit.*, note * p. 461, *supra)* of his investigations of some dysenteric intestines made under the supervision of Prof. v. RECKLINGHAUSEN, at Strasburg, it would appear probable that he has both seen and correctly appreciated this network. According to his account, an intestinal catarrh always precedes the diphtheritic process, which consists in the accumulation of a fibrinous exudation on the surface of the mucous membrane and in its substance. Then follows the necrosis of the mucous tissue (das Absterben des Schleimhautgewebes) and its transformation into a mass of albuminoid granules, *(i. e.*, granules which disappear on treatment with acetic acid.) Simultaneously a hyaline transformation of the bloodvessels takes place. He then adds: "Both in the granularly altered and in the unaltered tissue we found micrococci and bacteria. In the first case they appear as colonies, in the second simply scattered. Even before the tissues are quite broken down (wo das Gewebe noch nicht flüssig geworden ist) lymph-spaces (Saftcanälchen) filled with bacteria can be demonstrated in the submucosa." If by this the author means rod-like bacteria, he merely reaffirms the account of BASCH; if he means spherical bacteria, his observations agree with mine. KELSCH also undoubtedly saw the same network and represented it, though very imperfectly, in one of his figures. See note † to p. 470, *supra*.

† BASCH, *op. cit.*, p. 461, *supra*: "Der endliche Ausgang dieser Metamorphose des submucösen Bindegewebes ist wie bei der Schleimhaut körniger Zerfall." "Die faserigen sowohl als die zelligen Elemente des Bindegewebes sind nur in spärlichen Resten vorhanden und durch eine feinkörnige Masse, die man nach unseren bisherigen Vorstellungen als Detritusmasse auffassen und bezeichnen muss, substituirt." [*Op. cit.*, S. 214; also Fig. 11, Taf. XIII.] The rod-like and thread-like forms observed by BASCH in the lymph passages of the dysenteric intestine are figured in the same plate, but not described in his text as clearly as I could wish. He remarks merely, "Ich habe naturgetreu, so wie ich sie mit einem guten Hartnack'schen Instrument Ocular II Immersion 10 gesehen, in Fig. 13 dargestellt und muss, da ich zu einer Controlluntersuchung gegenwärtig kein Material besitze und seiner zeit dieselben nicht bestimmen konnte, ihre Benennung den Mycologen überlassen." The figure referred to represents three kinds of forms: Shorter or longer wavy rods; minute spherical forms; and, a little on one side of the figure, a peculiar short club-like rod. But the magnifying power employed is left quite uncertain. In the first place, the immersion objectives of Hartnack marked No. X vary considerably in magnifying power, just as the so-called $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{15}$, &c., of other makers do. According to the price-catalogue of Hartnack's instruments, appended to FREY'S work on the Microscope, [4te Aufl., Leipsic, 1871.] the No. X immersion, with ocular II, magnifies 600 diameters; but this represents rather the power intended than that actually possessed in any given case. Moreover, whatever the magnifying power of the objective and eye-piece, the mode in which the drawing was made (which is not stated) would introduce considerable variations in the dimensions of the picture. If it were made with the camera lucida, the magnifying power of the drawing would vary with the distance from the eye piece to the paper; and if drawn without that help, personal equation would come in to an extent fatal to precision. The difficulty in appreciating the drawing referred to by BASCH, (Fig. 13,) which results from the foregoing

stages of dysentery, and supposed to be due to the granular metamorphosis of both the fibrillated and cellular elements of the connective tissue, was really to a great extent composed of micrococcus. The attention of Basch, however, was diverted from the consideration of these minute spherical forms by his observation of larger elongated rod like and thread-like bodies, which he found in the lymphatic passages of both large and small intestine, as well as in the small veins where he could recognize them between the blood corpuscles. The real nature of these larger forms I can only conjecture, especially as the drawings of Basch are not wholly consistent with each other. I will not, therefore, attempt to decide whether these drawings represent merely a somewhat distorted view of the appearances I have described above or elements of a different nature, but simply remark that they do not correspond with my own observations.

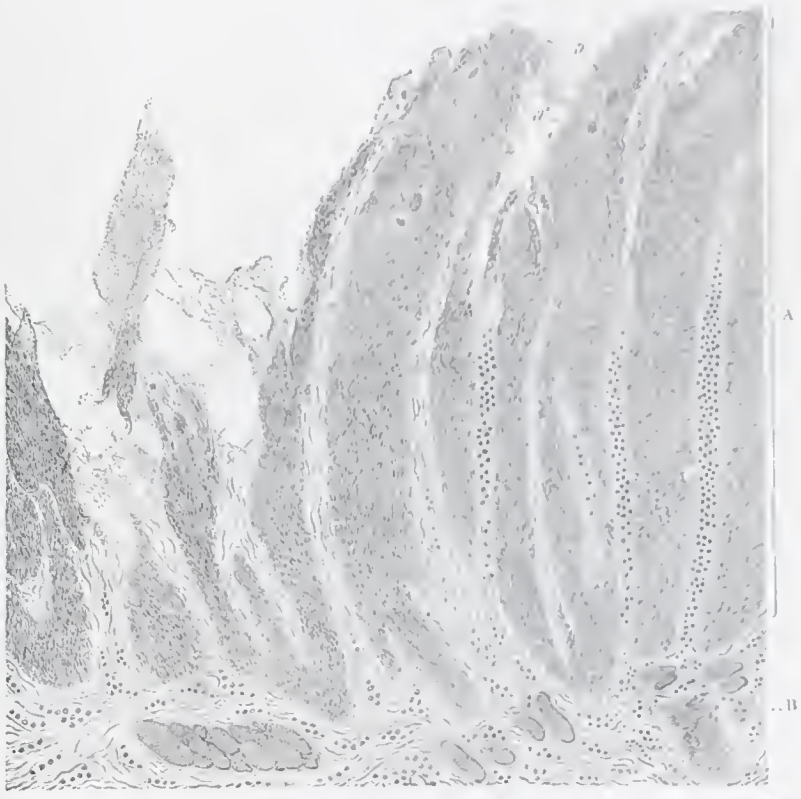



FIG. 19.—Perpendicular section of a dysenteric colon, showing sloughing of the circular muscular coat. Magnified 70 diameters. Copied from a photo-micrograph (No. 959, N. S.) of No. 7295, Microscopical Section. A. Represents the circular muscular layer which hangs in shreds into the cavity of the intestine. B. Scattered fascienli of muscular fibre-cells belonging to the longitudinal coat, pushed apart by connective tissue infiltrated with lymphoid elements. A similar infiltrated connective tissue may be observed between the fasciculi of the circular muscular coat, especially on the right of the picture. Towards the upper part of the piece several dark oval bodies can be observed near the free extremities of the sloughs. These are the micrococcus nests described in the text; those lettered *a*, *d*, are represented as seen with a higher power in the next figure.

In the specimen of colon from case 94 (No. 997, Medical Section) I noticed some peculiarities in the micrococcus invasion of the sloughs, which are represented in Figure 19. In this case, which was one of acute diphtheritic dysentery occurring in a subject whose general health was broken down by lung phthisis and intermittent fever, the greater part of

considerations, is still further increased by the circumstance that the plate contains two other figures, (Figs. 8 and 14,) in which the vegetable forms in question are also shown, but in both of which they are very much smaller than the figure just described, although all the figures purport to be drawn with the same power. On the supposition that Fig. 13 accurately represents the forms as seen with an actual magnifying power of 600 diameters or rather more, (and that in Figs. 8 and 14 they are only accidentally represented smaller,) they would appear to resemble very closely the large forms which are so frequently seen in water in which fragments of flesh are permitted to decompose, or those which BILLROTH—*Coccobacteria Septica*, Berlin, 1874, S. 54, also Taf. IV, Fig. 34—observed in the pericardial fluid of subjects dead of various diseases. If, on the other hand, BASCH has correctly drawn them in figure 8 as magnified by the power specified, they do not differ from certain forms ordinarily encountered in the intestinal contents. BASCH asserts that he found these forms in the central lymphatic sinuses of the villi of the small intestine and in passages which he supposed to be lymph sinuses between the crypts of Lieberkühn and just beneath the mucosa. They could be seen also in the veins of the submucosa between the blood corpuscles. In the lymph sinuses and small veins of the large intestine similar conditions were observed. The vegetable forms lay in the peripheral portions of the lymph sinuses, while the lymph cells occupied the central parts of the passages. They were to be found also between the connective-tissue bundles of the submucosa. Some time after reading the paper of BASCH I re-examined a number of specimens of dysenteric intestines which had been carefully preserved in alcohol since the war, and was readily enabled, in properly cut sections, to make out the appearances described in the text. Those of these specimens which had been placed in alcohol so soon after death that putrefaction had not had time to commence could be stained with carmine quite as readily as recently hardened preparations, and gave results which I believe are quite as trustworthy. A considerable number of the preparations made have been preserved in the Army Medical Museum, where they are now accessible for study by any competent person. In examinations of dysenteric intestines made during the war I had frequently observed the micrococcus infiltration of the sloughs and the micrococcus network in the submucous connective tissue. I confess that I misinterpreted these appearances, supposing the spherical granules observed to be partly coagulated fibrin, partly protoplasmic or fatty granules set free by the processes of necrobiosis. Nor do I now deny that this explanation is true for a portion of the granules observed, but the use of reagents puts it beyond question that there is a considerable portion for which it is not available.

the mucous membrane was destroyed by diphtheritic sloughing; one slough nine inches long is still attached by one extremity to the upper portion of the piece. In much of the surface from which the sloughs have separated the muscular coat of the intestine is laid quite bare and its circular layer has begun to slough, so that it everywhere hangs in shreds from the surface of the piece. In these sloughing shreds the muscular tissue has evidently begun to undergo putrid decomposition; its nuclei could not be recognized, nor could they be differentiated with carmine; the boundaries of the muscular fibre cells could be but indistinctly perceived. The tissue of the shreds merely presented an indistinctly fibrillated aspect, but here and there toward their peripheral extremities they contained peculiar oval bodies, which, on examination with higher powers, proved to be nests of micrococcus spherules.

Figure 20 represents two of these nests, magnified 400 diameters. They are of oval form, one .0015, the other .0025 of an inch in long diameter, and each consists of a large number of exceedingly minute spherical elements apparently imbedded in a transparent matrix, a slight excess of which on the periphery of each mass separates them from the surrounding tissue as if they were enveloped in a cyst. From the surface of the lower one, however, several thread-like processes, composed of similar spherical elements, find their way into delicate clefts between the adjacent fibre-cells of the decomposing muscle. These oval micrococcus nests are very similar to the forms named Ascococcos by Billroth,* who observed them especially in putrid flesh-water. Whether in this case they have any special significance, or whether their size and form are simply determined by the physical conditions of the muscular coat, just as the boundaries of the micrococcus network are determined by dimensions of the lymph spaces of the submucosa, I must leave for future observation to determine. In several of the sections of the colon of case 94 I observed also, in the subperitoneal connective tissue, small veins cut across, the interiors of which were stuffed with micrococcus arranged in the well known thread-like forms described above as occurring in

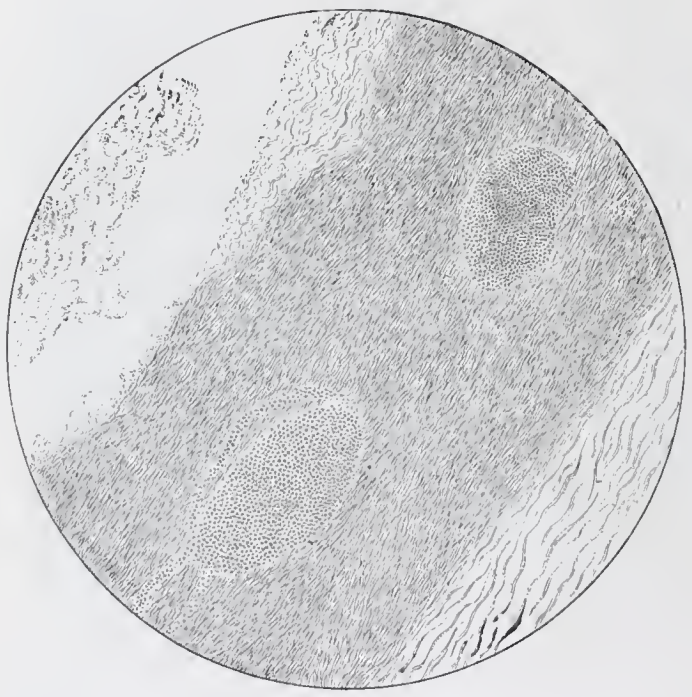


FIG. 20.—Micrococcus nests in a slough of the circular muscular coat of the intestine. Magnified 480 diameters by Powell & Lealand's $\frac{1}{12}$th immersion. Copied from a photo-micrograph, [No. 960, N. S.] The two nests represented are those marked *a*, *á*, in the last figure.

* T. BILLROTH—*Coccobacteria Septica*, Berlin, 1874—describes two forms of Ascococcos: a larger form [S. 12 *et seq.*, and Taf. III] and a smaller one, [Ascococcos parvus, S. 14 and 98, also Taf. II, Fig. 18,] the latter occurring in tiny rounded masses which in size and general appearance resemble the lymph corpuscles. It is the former of these varieties that I have in view. BILLROTH's figures in Taf. III I suppose represent smaller forms than mine; at least they are said to be drawn with a Hartnack's system 15 and ocular 3, giving a magnifying power of 1185, and if this is correct, of which, in view of the looseness of this mode of recording dimensions, I cannot feel sure, the largest of the oval forms he figures is not more than 30 micromillimetres in length, whereas the larger of the two nests in Fig. 20 is a little more than 60 micromillimetres long. But COHN—*Untersuchungen über Bacterien*, Beiträge zur Biologie der Pflanzen, Bd. I, Heft 3, S. 141—who adopts this form of vegetation as a new genus with the name *Ascococcus Billrothii*, [S. 151; see also Taf. V, Fig. 2,] says, with commendable precision, that its more spherical forms vary in diameter from 20 to 70 micromillimetres, while the elliptical ones may even attain 120 to 160 micromillimetres in long diameter, so that the forms I have figured fall quite within the observed variations in the dimensions of these bodies. As described by the authors cited, the Ascococcus forms consist simply of micrococcus united into clumps or colonies by a peculiar tough *glia* or jelly-like matrix, which gives them with high powers the appearance of being invested with a cyst

the submucosa of the diphtheritic intestine. From some of these vessels the beaded filaments appeared to have invaded the lymph spaces of the adjacent connective tissue, which contained a rich network of similar forms.

The frequency with which thrombi, having their point of departure in the diphtheritic sloughs, may be invaded by micrococcus during the life of the subject, the possible extent of this invasion, and especially the question of the transportation of these microscopical forms to distant parenchymatous organs and of the pathological consequences of this accident, are matters which as yet have had no thorough histological investigation in cases of dysentery. I have myself, during the war, several times observed in recent specimens the veins leading from the diphtheritic sloughs into the mesocolon occupied by thrombi which had in part been converted into a greenish-yellow fetid fluid, which under the microscope appeared to swarm with actively-moving dark-contoured molecules. I observed similar conditions in the thrombi leading from the diseased stump in cases in which amputations for gunshot wounds had been followed by necrosis of the marrow of the injured bone and pyæmia.* I do not now doubt that in the case of the decomposing thrombi in the dysenteric bowel a considerable part of these actively-moving molecules were really micrococcus, as has been abundantly demonstrated since that time in the case of the decomposing thrombi leading from injured parts; but at the time I did not comprehend the true significance of these molecules, which I supposed to be mere detritus-molecules, the products of putrefactive processes in the thrombi. In several cases in which this condition of the intestinal veins was associated with metastatic foci in the liver, as, for example, in case 896, I made futile efforts to discover visible thrombi in the branches of the portal vein leading to the metastatic nodules, but found that, "on the contrary, the vessel continues generally quite patulous even after it is involved in the substance of the morbid nodule."† The foci themselves contained a small quantity of yellow fetid fluid at their centres, which under the microscope appeared to consist of "disorganized liver tissue, granular matter and fat globules, but no pus."‡ This granular matter consisted of actively-moving, dark-contoured molecules quite like that in the putrid thrombi.

I do not now doubt that these molecules were chiefly micrococcus. I suggested, in 1866, that the immediate cause of the metastatic foci in these dysenteric cases, as in the pyæmic cases following gunshot wounds, was to be sought rather in the introduction into the torrent of the circulation of "the putrefying debris of the coagula which had formed in the veins" leading from the seat of the primary lesion, than in larger, more solid emboli which might be supposed to plug a branch of the portal vein, or of the pulmonary artery, of moderate size. I spoke of the detritus-fluid floating from the primary thrombi as "a liquid more viscid than blood, which could not be expected to circulate as readily as blood," and which "might be expected to be arrested in the capillaries," and "if so arrested, to set up there, by actual contact, a similar form of change"§ to that which was going on in the putrefying tissues from which it had floated. That these views were substantially correct, so far as they go, I do not doubt; but recent investigations of the pyæmic process, as it results from wounds, from throat diphtheria and other allied conditions, have brought up the question whether the micrococcus contained in the putrid semifluid substance, introduced

* J. J. WOODWARD—*Causes and pathology of pyæmia, (septæmia,)* Transactions of the American Medical Association, Vol. XVII. Philadelphia, 1866, p. 173.

† *Op. cit.*, p. 195.

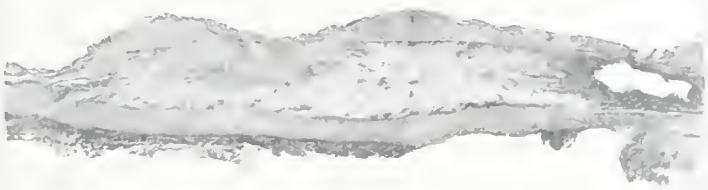
‡ *Catalogue of the Medical Section of the Army Med. Museum*, Washington, 1867, p. 81. § *Op. cit.* p. 198.

into the circulation from the primary local lesion, is not the essential morbific agent by which the secondary processes are generated.

I will not attempt to enter here upon the discussion of this question. To do so would require a detailed review of the numerous investigations into the pyæmic process which have appeared during the last ten years. Let it suffice to point out that the putrid fluid which floats from the decomposing primary thrombi in these cases consists not merely of the low vegetable forms, but of all the various products of the decomposition of the primary thrombi. Protoplasmic particles in a condition of active molecular change exist side by side with the newly originated vegetable forms, and it seems even more reasonable to suppose that the transportation of these is the immediate means of setting up a similar kind of decomposition, wherever they may be arrested in the distant capillaries, than to assign this role merely to the vegetable forms, and assume that they exercise specific morbid influences, without better evidence than we have yet acquired.

In a general way, indeed, I am disposed to regard the whole train of phenomena which I have sketched above, of the invasion of the diphtheritic sloughs and of the diseased but still living tissues of the dysenteric intestine by the swarm of vegetable parasites, as mere epiphenomena of the morbid process rather than as manifestations of its efficient cause. So long as we remain without means of distinguishing in any way between the vegetable forms constantly present in the normal intestinal canal and those which invade the diphtheritic sloughs, we cannot be logically justified in assigning to these forms any causal significance. On the other hand, if these forms are regarded as mere products of putrefaction, the phenomena of their invasion of the sloughs and even of adjacent living parts, so soon as the vitality of these parts is sufficiently depressed, become perfectly intelligible. In this connection I would particularly point out that, so far as I have been able to observe the process, the micrococcus invasion of the intestinal tissues never occurs until these are either quite dead or at least very greatly diseased, and that the formation of the diphtheritic slough and its invasion by micrococcus always precede the formation of the micrococcus network in the diseased submucosa. I cannot regard phenomena which occur so late in the course of the morbid processes as their efficient cause.*

* In this connection I must mention the attempts at the artificial production of diphtheritic inflammation by chemical irritants. Experiments of this character have been conducted by W. REITZ—*Untersuchungen über die künstlich erzeugte croupöse Entzündung der Luftröhre*, Sitzungsberichte der k. Akad. d Wiss., Bd. LV, Abth. II, 1867, S. 501; OERTEL—*Experimentelle Untersuchungen über Diphtherie*, Deutsches Archiv für klinische Med., Bd. VIII, 1871, S. 242; H. MAYER—*Ueber die morphologischen Veränderungen in Trachea und Lungen durch Ammoniak*, Archiv der Heilkunde, Jahrg. XIV, 1873, S. 512; and L. GRIFFINI—*Contribuzione alla Patologia generale del tessuto epitelico cilindrico*, L'Osservatore, Gazzetta delle Cliniche di Torino, T. 10, 1874, p. 497. If dilute solutions of ammonia be injected into the trachea of a rabbit or dog, a merely catarrhal inflammation is produced; if strong solutions are used, a pseudomembranous or diphtheritic layer is developed. OERTEL, who performed this experiment on rabbits, admits that the resulting process shares all the anatomical characters of croupous inflammation, but holds that it differs from diphtheritic inflammation in the absence of the local sloughing and of the metastatic processes, which he believes to be produced only by the vegetable forms characteristic of diphtheria—*op. cit.*, S. 347. MAYER, also, experimented on rabbits, and believed himself justified in concluding that the process resulting from the application of ammonia was by no means identical with croup. He regarded it rather as a catarrhal process complicated, if stronger solutions were used, by superficial or deeper necrosis of the tissue. In these sloughs micrococcus and other low vegetable forms ("zahlreiche Pilze, bald nur punkt-und stäbchenförmige Micrococcen"—"bald längere ketten- und fadenförmige Gebilde," *op. cit.*, S. 515) soon made their appearance in great abundance. Finally, GRIFFINI, who experimented on dogs, regards the pseudomembrane produced as identical with that of the croupous process in man, ("le pseudo-membrane croupose naturali dell'uomo.") Generally he found no vegetable forms in the pseudomembranous layer, but in one case, in which the dog had been dead a few hours before he made the examination, he found an abundance of bacteria and micrococcus, ("di abbondanti bacterii o micrococchi,") and he forcibly demands whether the micrococcus or the ammonia is to be looked upon as the cause of the process. I have myself made no experiments in this direction, but those that I have cited certainly appear to me to strengthen the position I have taken in the text, that the vegetable forms found in the pseudomembrane are the consequence, not the cause, of the local process. Here I must mention the experiments of ARCADIUS RAJEWSKY (*op. cit.*, p. 462, *supra*) on the artificial production of the dysenteric (diphtheritic) process in the colon of rabbits. This observer found that bacteria-holding fluids (he does not mention from what source derived) injected into the bowel or into the bloodvessels of a healthy rabbit did not develop the diphtheritic process; but if a smart intestinal catarrh was first developed by the injection of a dilute solution of ammonia, and then a fluid containing bacteria (this time he says "eine Micrococcen enthaltende Flüssigkeit") was injected into the bloodvessels, the diphtheritic process was developed in the inflamed parts, and the micrococci localized themselves in the inflamed mucous membrane. The action of the ammonia in solution alone did not produce this process. The provisional communication cited being accompanied by no details, (the promised complete account of these experiments, if published, has not yet reached me,) it is difficult to form an opinion as to its full significance. So far as it goes, it seems to show that whatever part may be taken by the low vegetable forms, they are of themselves insufficient to develop the diphtheritic process in the intestine.



If, now, the patient survives the occurrence of the tissue-necrosis just described, the sloughs sooner or later begin to separate by the ordinary suppurative process. Lymphoid elements accumulate in a dense swarm in the tissues immediately adjacent to the boundaries of the necrosed portion, the matrix between these lymphoid elements liquefies and they are set free as pus corpuscles. The eschar itself, no longer adherent to the adjacent structures, is readily detached by the peristaltic motion of the bowel. The depth of the primary diphtheritic ulcer which results from this process depends upon the depth of the primary diphtheritic infiltration. The upper portion of the mucosa only may be stripped off, and when sections are cut the remains of the cul-de-sacs of the intestinal follicles may still be recognizable at the bottom of the ulcer. More frequently, however, the whole of the mucosa and more or less of the submucosa is involved in the eschar, and the bottom of the ulcer is formed either by some portion of the submucous layer or by the muscular coat of the intestine.

But whatever its original dimensions, the diphtheritic ulcer may subsequently extend both in area and in depth, either by secondary sloughing or by a true ulcerative process, the lymphoid elements continually floating off from the surface as pus corpuscles, while they continually accumulate in the tissue adjoining the margins of the ulcer. Frequently the muscular coat of the bowel is thus invaded. The lymphoid elements accumulate in the lymphatic passages and in the interstices between the muscular fibre-cells. As to what becomes of the latter I cannot be sure, for they usually retain their integrity till quite obscured by the accumulation of the lymphoid swarm; I am inclined to think that they are converted into granular detritus. Simultaneously with the invasion of the muscular coat, lymphoid elements begin to accumulate in the subperitoneal connective tissue, which, by the time the spreading ulcer has penetrated the muscular coat, is already densely infiltrated. Perforation of the intestine then readily takes place, either by the formation and separation of a little slough, or by the rupture of the thin tissue, which forms the bottom of the ulcer, during a spasmodic peristaltic contraction.

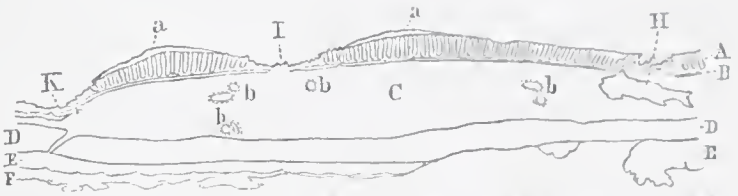



FIG. 21.—Diagram explanatory of plate facing page 480. A. Mucous membrane. *a. a.* Adherent pseudomembrane. B. Muscle of Brücke. C. Submucous connective tissue. *b. b. b.* Blood-vessels cut across. D. D. Circular, E. E. Longitudinal muscular coat. F. Subperitoneal connective tissue. H. Follicular ulcer. I. Superficial diphtheritic ulcer. K. Deep diphtheritic ulcer

Some of the appearances presented by such ulcers, when perpendicular sections are examined by low magnifying powers, are shown in the steel engraving facing page 480, which is copied from a photo-micrograph representing a portion of No. 687, Microscopical Section, as seen with a magnifying power of twelve diameters. The specimen is one of a series of cuts [Nos. 687 to 691, Microscopical Section] from a boiled piece, stained with yellow aniline and mounted in gum and glycerine. It is a portion of the colon of a soldier who died of dysentery, in Washington, during July, 1865. In this case the diphtheritic process was associated with follicular ulceration, probably the result of a chronic flux, and accordingly follicular ulcers appear also in the cuts. The portion of No. 687 represented in the plate exhibits near its right extremity one of these ulcers; the section has passed through it a little to one side of its orifice, so that it appears rather as a minute abscess, .04 of an inch in diameter, than as an ulcer. Somewhat on the left of the middle of the piece the cut passes through a small superficial diphtheritic ulcer, which is limited to the gland-

ular layer of the mucosa, and does not at its deepest point penetrate below the level of the muscle of Brücke. On the extreme left it passes through the margin of a much larger diphtheritic ulcer, which invades the submucous connective tissue and penetrates almost to the circular muscular coat. The surface of the mucous membrane on each side of the central superficial ulcer is thinly coated with pseudomembrane. The submucous connective tissue is infiltrated with innumerable lymphoid elements which are most densely packed around the margins of the ulcers.

From the account which has been given of the histology of the diphtheritic process, the conditions under which hæmorrhage from the bowels occurs in diphtheritic dysentery may readily be understood. Just as in simple inflammation of the intestinal mucous membrane, this may happen, especially in the early stages of the disease, from ruptures in the capillary plexus surrounding the orifices of the glands of Lieberkühn, or it may occur, at a later stage, from the rupture of vessels of more or less considerable size during the separation of the diphtheritic sloughs, or still later, after the sloughs have separated, from the rupture of capillaries or of larger vessels in the granulation tissue of the edges or bottoms of the diphtheritic ulcers. No doubt, also, sometimes, even when the patient has not been subject to hæmorrhoids, a rupture of the hæmorrhoidal veins may take place during violent tenesmic efforts, and hæmorrhage may result from this source.

After necrosis of any portion of the diphtheritic layer has once taken place, resolution is of course impossible so far as that portion is concerned. The dead part must inevitably separate if the patient survives, and the only mode of recovery is by the healing of the resulting ulcer. This healing takes place always by a process of granulation and the development of cicatricial connective tissue, very much as occurs in the repair of ulcers of the skin. I have not had sufficient opportunity to study the details of the process to be able to give more than a general notion of its character. In its essence it appears to consist in the development of a fibrillated matrix between the lymphoid elements which accumulate at the bottom and margins of the ulcers after the fashion of granulations. By the contraction of this fibrillated matrix the edges of the ulcers are approximated, so that the scar is always much smaller than the original ulcer. The cicatricial tissue is finally coated with a columnar epithelium, which is probably formed by an outgrowing of the normal epithelium at its margins, as occurs in the case of skin ulcers; but, so far as I know, the glandular layer of the mucous membrane is never reproduced.

Simultaneously with the development of the fibrillated matrix in the granulation tissue, by which the ulcer is filled up, a similar matrix is developed between the lymphoid elements that infiltrate the adjoining mucous and submucous layers. The result of this process is the formation of a series of radiating, branching and anastomosing ridges which often extend one-tenth of an inch, or even farther, from the edge of the ulcer into the surrounding mucous membrane. These push the adjacent follicles of Lieberkühn preternaturally apart, and give rise to the peculiar characters of the edges of the cicatrices shown in the plate facing page 160. This peculiar extra-marginal process, which I have never observed in the cicatrices of typhoid or catarrhal ulcers of the small intestine, while it is always present in the cicatrices of colon ulcers, appears to afford a partial explanation of the circumstance that puckering, contraction and actual diminution of the lumen of the intestine more frequently follow dysenteric than typhoid ulcers.

### 3. Chronic Dysentery.

As was explained at the commencement of this section, it is proposed to include under the designation chronic dysentery* all the chronic fluxes observed during the war, with the exception of those resulting from tubercular ulceration of the intestines. This course is adopted from the purely clinical point of view and as a mere matter of convenience, for it is distinctly recognized that anatomically the chronic fluxes might naturally be divided into two great groups, those resulting from chronic inflammation of the mucous membrane of the bowel with or without ulceration, and those resulting from the large unhealed ulcers left after the separation of diphtheritic sloughs. The fact that a chronic flux remains after the occurrence of all the usual symptoms of acute diphtheritic dysentery would afford just grounds for believing it to belong to the second group; but as the cases of chronic flux usually present themselves in military hospitals in time of war, it is not possible to be so sure of the previous history as to make use of it for diagnostic purposes; and the symptoms of the chronic fluxes resulting from both groups of lesions, as well as the treatment which should be pursued, are so similar that no useful purpose would be subserved by the doubtful attempt to establish clinical distinctions based upon anatomical grounds. The results of any attempt to subdivide these cases into chronic diarrhœa and chronic dysentery, in accordance with the presence or absence of tenesmus, or of mucus, muco-pus, pus or blood in the stools, or any other clinical evidence with which I am acquainted, would not be found to correspond with any anatomical classification. When, after the separation of the diphtheritic sloughs in acute dysentery, a chronic flux remains, tenesmus very often ceases to torment the patient, although it may recur at intervals, and the same happens in chronic fluxes unaccompanied by ulceration of the bowel as well as in those accompanied by ulceration not the result of the diphtheritic process; so too with the other symptoms.

Symptoms.—Whatever the nature of the anatomical lesions from which chronic dysentery results, the local and constitutional symptoms are of the following character: The prominent local symptoms are gripings, flatulence, uneasy or painful sensations in the stomach and bowels, and liquid, variously disordered stools, consisting of the products of digestion, which is impaired by the intestinal disorder, mingled with the morbid discharges from the diseased mucous membrane. The prominent constitutional symptoms result from insufficient nutrition consequent upon the incomplete manner in which the digestive process is performed; steadily progressive debility and emaciation, culminating in extreme marasmus, and often accompanied by a hectic febrile movement, are the more important phenomena.

The disease frequently comes on after one or several attacks of acute diarrhœa, and in such cases might very properly be spoken of as chronic diarrhœa; but usually, after having persisted for several months, if not sooner, muco-pus or pus, with or without blood, makes its appearance in the stools, and if death ensues post mortem examination discloses chronic inflammation of the colon, often accompanied by ulceration, precisely as in those cases which occur after acute catarrhal dysentery. The proportion of cases which commence in diarrhœa and run their course without dysenteric complication cannot be determined from the statistics of the war, but in a very large number, perhaps in the majority, the dis-

* In my *Outlines of the chief camp diseases of the United States Armies*, Philadelphia, 1863, p. 252, I applied the designation chronic diarrhœa to this group of cases, out of deference to what was at the time the usage of the majority of our military surgeons, but subsequently, in Circular No. 6, pp. 117 and 123, I gave the preference to the term chronic dysentery used in this work.

either began as acute catarrhal or diphtheritic dysentery, or one of these diseases occurred as an intercurrent affection during its progress. In still another group of cases chronic dysentery remained as a sequel to some form of continued fever.

The *stools* of chronic dysentery vary extremely both in frequency and character. So far as the latter point is concerned they change, on the one hand with the degree to which the digestive processes are impaired, in accordance with which the normal fæces are replaced by a more or less fluid pap that varies in color with the character of the biliary secretion, and is often mixed with wholly undigested fragments of the food, readily recognizable by the naked eye; and on the other hand with the degree to which these products of the digestive process are commingled with discharges from the inflamed or ulcerated intestinal surface, mucus, muco-pus, pus or blood. To these modifying conditions it may be added that variations in color also result from the accidental presence of coloring matters derived from the food, or from certain medicines, concerning which enough has been said in connection with acute diarrhœa.*

Those chronic fluxes in which the stools habitually consist of a semi-fluid pap were described by the ancient physicians under the designation Cœliac affection.† This term was not employed by Hippocrates, and was bestowed by Celsus upon a different disease; by the

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* Page 274, *supra*.

† The Cœliac affection, κοιλιακὴ διάθεσις or κοιλιακὴ νοῦσος [so called from κοιλία, ventriculus—see ARETÆUS, *Morb. Diut.*, Lib. II, Cap. 7, Boerhaave's Ed., p. 58. Synonyms: morbus cœliacus, fluxus cœliacus, cœliaca, passio cœliaca, affectio cœliaca, passio ventriculosa, alvi fluxus chylosus, diarrhœa chymosa and chylosa, chylorrhœa, fluor albi intestini recti; English—the cœliack passion, chylous flux, chylous looseness, chylous diarrhœa; French—flux céliaque or cœliaque; German—Bauchfluss, weisse Bauchfluss, Milchfluss, Milchruhr, Schleimfluss] is not mentioned in the Hippocratic writings, and the morbus cœliacus described by CELSUS, Lib. IV, Cap. 12, is evidently a very different affection from that to which subsequent writers have given the same name, since it was characterized by obstinate constipation. "In ipsius vero ventriculi porta consistit is, qui et longus esse consuevit; κοιλιακὸς a Græcis nominatur. Sub hoc venter indurescit, dolorque ejus est: alvus nihil reddit, ac ne spiritum quidem transmittit: extremæ partes frigescunt: difficulter spiritus redditur"—Lee's *Celsus*, Vol. I, p. 289. According to ARETÆUS, [*loc. cit.*,] cœliacus is a form of chronic diarrhœa due to deficient digestive power on the part of the stomach, in consequence of which the steols are fluid, whitish, clay-like or mud-like, destitute of bile, offensive and accompanied with flatulence, offensive eructations, rumbling in the bowels, progressive emaciation and dryness of the skin. He remarks that it is a tedious malady and difficult to cure. ARCHIGENES—*De cœliaca affectione* in ÆTIUS, Tetrab. III, Serm. I, Cap. 37, Lyons Ed., 1549, p. 589—used the term in the same sense as ARETÆUS, and emphasized the role of the stomach. According to him, it is not every flux in which the stools are fluid, crude and undigested that deserves the name of cœliac affection, which can be properly employed only when the flux results on account of the inability (imbecillitas) of the stomach to digest the food. GALEN makes occasional mention of the cœliac affection, as, for example, in *Com. V in Epidem. VI*, Sect. 5, § 27, [Ed. Kühn, XVII, B, 291,] and in several places in which he mentions remedies adapted to the treatment of these affected by it. In the *Definitiones Med.*, ascribed to GALEN, the cœliac affection is said to be simply a chronic flux accompanied by emaciation. "Cœliaca affectio est alvi fluxio non recens sed diuturna cum tormioibus multis dejectionibus corpore simul marcescente," [Ed. Kühn, XIX. 421.] CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 3, Amsterdam Ed., 1709, p. 499—discusses this disease at some length under the designation "ventriculosa passio," which he expressly states is the equivalent of the cœliac affection of the Greeks. It may result, among other causes, from a previous indigestion or dysentery. The stools may be of the most various consistency and color, white, yellow and frothy, green, livid or black, purulent or mixed with blood. Borborygmus and an offensive odor are accompanying symptoms. The patients lose their appetite, or sometimes have excessive appetite, become debilitated, pallid; sometimes there is fever. Their bodies have a bad odor; their feet and hands swell. Dysentery is an occasional and serious complication. The disease is one of solution, yet sometimes it is accompanied by a stricture, (*i. e.*, constipation.) The description, of which the foregoing is an abstract, might have been drawn from the chronic fluxes of the civil war. ALEXANDER of TRALLES—Lib. VIII, Cap. 5, Basel Ed., 1556, p. 413—gives a brief description of the cœliac affection drawn from the writings of PHILUMENUS. It is due to atony of the stomach; the steols are liquid, not well digested, of different colors, sometimes bloody. It is a chronic disease; the body becomes emaciated, is consumed by wakefulness and indigestion; tormina and loss of appetite accompany it. PAULUS ÆGINETA—Lib. III, Cap. 40, Syd. Soc. transl., Vol. I. p. 520—pointed out the great similarity between the cœliac affection and the form of lientery which results from digestive debility, [see note on lientery, *infra*,] and expressed the opinion that the only difference is that in lientery the indigestion is more intense and the passage of the food through the intestines more rapid. In the same sense the two diserders were elaborately described by SENNERTUS—*Pract. Med.*, Lib. III, Pars 2, Sect. 2, Cap. 5, Opera, Paris, 1641, T. III, p. 111—"De Lienteria et Cœliaca affectione." Subsequently, however, prominence was given more and more, in the conception of the cœliac affection, to the whitish character of the stools, which ARETÆUS had insisted upon. SYLVIUS—*Prax. Med.*, Lib. I, 1667, Cap. 13, Opera, Amsterdam, 1679, p. 180—proposed to make two species: In the first, stomach digestion takes place, but intestinal digestion is so imperfect, especially on account of deficiency of bile, that the intestinal contents are not separated into chyle, &c., but voided as a whitish pultaceous mass; such stools are seen in jaundice, whence he proposed to call this species "alvi fluxus ictericius." In the second species chyle is duly separated, but not absorbed by the lacteals, whence he proposed to call this species "alvi fluxus chylosus." DOLÆUS—*Encyc. Med. Dogm.*, Lib. III, Cap. 3, Frankfort, 1703, p. 220, De diarrhœa, lienteria et cœliaca—calls this latter species "diarrhœa chylosa." See also the article Cœliaca Passio in the *Dictionary* of R. JAMES, Vol. II, London, 1745. B. L. TRALLES—*Usus opii salubris et noxius in morb. medela*, &c., Sect. III, Breslau, 1760, Cap. 3, § 20, p. 231—called the first species of SYLVIUS diarrhœa chymosa, the second diarrhœa chylosa. SAUVAGES is certainly wrong in citing the d. chymosa of TRALLES as a synonym of c. chylosa; TRALLES mentions both as two varieties of the cœliac flux, the discharge consisting of chyme in the first case, of chyle in the second. He says: "Lienteriam excipiat fluxus cœliacus, sive diarrhœa chymosa et chylosa. Hæc adest, quando ingesta jam in chymum mutata, aut ipse chylus cum fœcibus ejicitur." SAUVAGES admitted the cœliac affection into his nosology under the designation Cœliaca, although he remarked that its characters are obscure, unless they are taken from the whiteness of the dejections. He made four species: c. chylosa, c. purulenta, c. mucosa and c. lactea, the latter affecting women after delivery—*Nos. Meth.*, 1768, T. II, p. 360. CULLEN, in his nosology, (1769,) abandoned the genus, and made cœliaca merely a species of diarrhœa—Works, THOMSON'S Ed., London, 1827, Vol. I. p. 313 Meanwhile R. A. VOGEL—*Diss. fluxus cœliaci genuina notio et ratio exposita*, Gottingen, 1768; also *Prælect. Acad.*, Gottingen, 1772, p. 225—revived once more the old conception of the cœliac affection which embraced other than white stools, as already mentioned. He rejected the theory of SYLVIUS

other Greek and Roman writers it seems to have been used without regard to the color of the stools, except by Aretæus, who applied it especially to those cases in which they were whitish from deficiency of bile. This latter signification of the term was again brought into general use during the seventeenth century, when Sylvius subdivided these white fluxes into two species, those in which the discharges were more pap-like or pultaceous, and those in which they consisted of a creamy fluid supposed to be composed of chyle. The term chylous diarrhœa [alvi fluxus chylosus] which he proposed for this latter variety was subsequently employed in many quarters as a synonym for the cœliac affection; but after Richter and J. P. Frank had pointed out that the whitish stools called chylous really owed their appearance to the presence of mucus and pus, this term no longer appeared appropriate, and with its discontinuance the older term cœliac affection and its various synonyms have also become obsolete.*

More uniformly since the era of the Hippocratic writings the term Lientery has been bestowed upon those chronic fluxes in which undigested fragments of the food can be recognized in the stools. But since this condition may occur in both diarrhœa and dysentery under the most diverse circumstances, and stands related to the character of the food as well as the degree to which the digestive process is impaired, the term has very properly passed out of use as the designation of a particular species of flux, although the adjective

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as to the nature of the disease, and supposed it to arise from a peculiar cachexia caused by obstructions of the mesenteric glands liver spleen and pancreas. He altogether denied that the fluid voided could ever be considered as chyle, and regarded it as a mixture of morbid secretions, bile, pancreatic and intestinal juice, &c. This effort to revive the old broader use of the term was, however, unsuccessful. Medical writers continued to limit it more and more to fluxes in which the discharges were whitish, and especially to those in which they were supposed to resemble chyle. These however A. G. RICHTER—*Med. u. Chir. Bemerk.*, Bd. I, Gottingen, 1793, S. 70—explained as consisting merely of mucus, and, comparing such discharges to fluor albus, proposed to call the affection fluor albus intestini recti. See also *Die spec. Ther.* of the same author, Bd. IV, Berlin, 1822, S. 149. JOHN PETER FRANK—*De Cur. Hom. Morb. Epit.*, Lib. V, Pars 2, § 683, Milan Ed., 1832, T. III, p. 418—adopted a very similar view, regarding the matter discharged as puriform, comparing it to the sputa of phthisis, and suggesting that the disease might be designated a tabes of the intestinal tube—"tabem puriformem, lutuleotam tubi intestinalis constituere putamus." The use of the term cœliac affection and of its various synonyms has gradually been abandoned. In addition to the works referred to above, I may mention the theses of J. G. H. UHLHOFF—*De morb. cœliaco ejusque genuina notione*, Gottingen, 1787, and J. B. FLIESS—*De morb. cœliaco*, Halle, 1791, neither of which have I been able to see; and the following works, which may be consulted with advantage: C. F. MEYER—*De affectione cœliaca ex viscerum abdominalium infarctu oriunda*, Frankfort-on-the-Oder, 1794; RENAULDIN—*Flux cœliaque ou cœliaque*, Dict. des Sci. Méd., T. 16, Paris, 1816, p. 46; ANDREAS LUND—*Von der Milchruhr (Fluxus cœliacus)*, Sammlung auserlesener Abhandlungen zum Gebrauche praktischer Aerzte, Bd. XXI, St. 2, Leipsic, 1804, S. 3; S. G. VOGEL—*Von der Milchruhr*, Handb. der pract. Arzneiwiss. Bd. VI, Stendal, 1816, S. 86; C. A. W. BERENDS—*Der Bauchfluss*, Vorlesungen über pract. Arzneiwiss, Bd. I, Berlin, 1827, S. 134; also *Der weisse Bauchfluss. Milchfluss, Milchruhr*, Bd. VII, 1829, p. 97; J. MASON GOOD—*Chylous looseness*, Study of Med., 1822, Amer. reprint, Phila., 1825. Vol. I, p. 177; W. SACHSE—*Cœliacus fluxus*, in Encycl. Wörterb. der med. Wiss., Bd. VIII, Berlin, 1832, S. 92; M. E. A. NAUMANN—*Schleimfluss des Mastdarmes*, Handb. der med. Klinik, Bd. IV, Abth. II, Berlin, 1835, S. 170.

* In this connection I may refer to the diarrhœa alba or Hill diarrhœa of certain English writers on the diseases of India, which appears to be very similar to the cœliac affection of ARETÆUS. ANNESLEY—*Diseases of India*, London, 1828, Vol. II, p. 343—mentions the appellation "white flux," as long employed popularly in India for a form of chronic diarrhœa in which, "owing to obstruction of the biliary secretions," the stools have a whitish color. CRAIGIE—*Elements of the Practice of Physic*, Vol. I, Edinburgh, 1837, p. 914—who makes the hepatic flux a variety of chronic tropical dysentery, states that in certain cases "the stools become of a whitish color, are mixed with portions of half-digested aliment, and are passed with painful straining. In this state the disease is termed by the soldiers the *White flux*." COPLAND—Art. *Dysentery*, Dict. of Pract. Med., Vol. I London 1858, p. 778—adopts the description of the white flux given by ANNESLEY. This white flux, so far as I know, was first connected with the Hill regions by ALEXANDER GRANT—*Remarks on Hill diarrhœa and dysentery*, Indian Annals of Med. Sci., Vol. I, 1853-4, p. 311—who wrote: "The Hill endemic may be well designated as a diarrhœa alba," and remarks: "I prefer this term to chylous or milky, or that used by Dr. Good, gypseous or chalky. All depend upon deficiency and vitiation of the secretions from the liver," (p. 320.) He believed that the causes of this condition were "partly malarious partly secretive" (p. 317.) W. A. GREEN—*A short account of Hill diarrhœa and dysentery*, same Volume, p. 507—writes: "The disease has been called scorbutic dysentery, and the general character of the symptoms and the post mortem appearances bear out the designation." "The first symptoms consist generally of white purging and abdominal distention and great loss of strength and listlessness. In many of these cases inquiry has shown that there had previously existed a state of soreness of the mouth and gums, and looseness of the teeth, and perhaps purple blotches upon the extremities, or these scorbutic symptoms may have appeared soon after the diarrhœa or dysentery. Here is an index of the condition of the system," &c. This paper is accompanied by the details of a number of autopsies, from which it would appear that the most common anatomical lesion was chronic intestinal catarrh, with or without follicular or other ulcers of the colon. W. J. MOORE—*Hill diarrhœa or diarrhœa alba*, Trans. of the Med. and Phys. Soc. of Bombay, No. IX, N. S., 1859, p. 109—combats the opinion that this disease is of malarial origin, and shows that it is not peculiar to the Hill districts of India. He attributes the absence of bile from the stools to deficient secretion, and regards the fact that jaundice does not coexist as favoring the opinion that the biliary coloring matter is formed in the liver rather than preformed in the blood. According to SMART—*The diseases of Hong Kong and the Canton river station*, Lancet, August, 1861, p. 114—a very similar form of flux was observed at the Royal Naval Hospital Hong Kong, where it was sometimes designated "diarrhœa acholyca," on account of the yeasty or pipe-clay stools. Compare the interesting remarks of SIR J. FAYRER—*Chronic diarrhœa of India and the Tropics*, The Lancet, September 16, 1876, p. 389): "It is known as 'diarrhœa alba,' or white flux—so called from the grey white, light or clay-coloured evacuations, which are frequent, copious, fluid or semi fluid, often frothy, and occasionally lienteric, especially after any transgression in diet; or mixed with mucus tinged with blood, when any fresh source of enteric irritation or congestion may have been induced. When death occurs at an early period, "the intestines are found contracted but with the mucous lining thickened and congested, even ulcerated. After protracted disease "the coats of the bowel are found to be attenuated and diaphanous, the seat of amyloid degeneration, frequently ulcerated in both ileum and colon," &c. Cases corresponding to this description were common enough during our civil war.

lienteric is still occasionally applied to stools containing undigested fragments of food which can be recognized by the naked eye.* In the chronic fluxes of the civil war the stools very frequently presented the lienteric character. The note of Acting Assistant Surgeon Mercer, in Section 2 of this chapter,† gives an excellent idea of the conditions which some of these cases presented. Whenever the troops were fed chiefly upon hard bread, which was often enough the case, especially in the field, fragments of the biscuit became so common, in the stools of those whose bowels were loose, that the circumstance became a frequent topic of jocular remark. The feculent matters with which these undigested fragments were mingled were often whitish, clay-colored or mud-like, sometimes pale-yellow, yellow, greenish-yellow or greenish-brown, these colors being to a great extent dependent upon the quantity and character of the biliary admixture; it should be added that whitish clay-colored stools frequently existed without any trace of jaundice.

The presence of blood in the stools gave them a pinkish, reddish, dark-brown or black color, in accordance with the quantity of blood admixed and the degree to which it was modified by the presence of the intestinal gases. Occasionally pure blood was passed in considerable quantities.‡ Further modifications were produced by the admixture of mucus and pus; the first appeared in the form of stringy, glairy masses resembling the white of eggs, the latter as a creamy fluid. Both were, as a rule, intimately mixed with the liquid feculent matters, but not infrequently stools composed almost entirely of muco-pus or pus,

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* Lientery, λειεντερία [from λεῖος, smooth, slippery, and ἔντερον, intestine. Synonyms: Lævitas intestinorum, Magenrubr] is a term which frequently occurs in the Hippocratic writings as an appellation of those chronic fluxes in which undigested food can be recognized in the stools. Note, for example, in the treatise on *Affections*, § 24, [Ed. Littré, VI, 237,] "Lientery: The food is voided without being digested, the stools are liquid; there is no pain, but the body emaciates." See also *Prorrhetics*, Lib. II, § 23, [Ed. Littré, IX, 53:] and *Regimen*, Lib. III, § 79, [Ed. Littré, VI, 625,] "The food passes moist and undigested, as in lientery, without causing any suffering;" also the same, § 80, [Ed. Littré, VI, 627.] Acid eructations in lientery were regarded as a favorable sign, *Aphorisms*, VI, 1, [Ed. Littré, IV, 563.] Diarrhœa is followed by dysentery, and dysentery by lientery, *Aphorisms*, VII, 70, 77, [Ed. Littré, IV, 605.]· HIPPOCRATES clearly did not regard all chronic fluxes as lientery, for in *Aphorisms*, III, 30, [Ed. Littré, IV, 501,] he separately mentions chronic diarrhœas [διάῤῥοιαι χρόνιαι] and lienteries [λειεντερίαι] among the diseases of middle life. See also the statement of the Hippocratic conception of lientery by GALEN, *Com. in Aph.*, Sect. VI, § 1, [Ed. Kühn, XVIII, A, 9.] CELSUS—Lib. IV, Cap. 16—under the designation *Lævitas intestinorum*, describes the very same condition: "Ex tormínibus interdum intestinorum lævitas oritur; qua continere nihil possunt, et quidquid assumptum est, imperfectum protinus reddunt." ARETÆUS—*Morb. Diut.*, Lib. II, Cap. 10, [Boerhaave's Ed., p. 62]—attributed lientery to cicatrices in the intestine left after dysentery. The food is passed undigested, and atrophy, pallor and atony seize upon the patient. But sometimes also the disease exists when there are no cicatrices in the intestine, having been established merely by habit and a tendency to diarrhœa, the result of impaired digestion. GALEN used the word lientery quite in the Hippocratic sense. See, besides the passage cited above, *Com. II in Epidem. I*, § 36, [Ed. Kühn, XVII, A, 132,] and other places. In the *Def. Med.*, § 271, [Ed. Kühn, XIX, 422,] the idea of intestinal cicatrices left after the ulcers of dysentery is introduced. So, also, in another Galenical treatise of doubtful origin, *Introductio seu Medicus*, Cap. 13, [Ed. Kühn, XIV, 754:] "Ex dysenteria intestinorum lævitas oritur, ubi ex magna ulceratione multæ cicatrices intestinis oboriuntur, propter quas cibum non retinent: unde ex intestinorum lævitate vocata est leienteria." There is, however, another variety due merely to intestinal debility, [ex intestini imbecillitate,] which, like the former, is a grave disease and not easily cured, *(loc. cit.)* This two-fold conception of lientery is clearly recognized by ÆTIUS—Tetrab. III, Serm. I, Cap. 51, Lyons Ed., 1549, p. 618—and by PAULUS ÆGINETA—Lib. III, Sect. 40, Syd. Soc. transl., Vol. I, p. 520. In subsequent times the word retained essentially the same meaning, and it was introduced in the old sense into the nosology of SAUVAGES—*Nos. Meth.*, Amsterdam, 1768, Tom. II, p. 361—but with the remark that it seems rather a species of diarrhœa and not a distinct genus. Nevertheless SAUVAGES recognized five species of lientery, viz: 1. ex ulcere ventriculi, 1. spontanea, 1. scorbutica, 1. aphthosa and 1. secundaria. CULLEN put into practice the hint of SAUVAGES, and in his nosology makes lientery simply a species of diarrhœa—CULLEN'S Works, Thomson's Ed., London, 1827, Vol. I, p. 313. Consult also, on the subject of lientery, the following works: F. C. LIEBEROTH—*Casum de lienteria in puero observata et curata sistens*, Halle, 1750; C. H. FICK—*De lienteria*, Jena, 1794; MONFALCON—Art. *Lienterie*, Dict. des Sci. Méd., Tom. 28, Paris, 1818, p. 170; S. G. VOGEL—*Handb. der pract. Arzneiwiss*, Bd. VI, Stendal, 1816, S. 75; FRIEDREICH—*Ueber die Lienterie*, Würzburg, 1824, in which much of the literature is referred to; C. A. W. BERENDS—*Vorlesungen über prakt. Arzneiwiss*, Bd. I, Berlin, 1827, S. 131, and Bd. VIII, 1829, S. 427. The last two authors use Magenruhr as the German synonym. Both lientery and the cœliac flux, the latter under the well known designation chylous diarrhœa, reappear once more in the classification of L. M. ANDRIEU—*De la diarrhée*, Paris Thesis No. 188, 1868—which is, with a trifling modification, that taught in the lectures of Professor GERMAIN SÉE, of the Faculty of Medicine of Paris. This gentleman "has divided diarrhœa, in accordance with the chemical characters of the dejecta, into four species: mucous, serous, albuminous, and alimentary diarrhœa;" to these ANDRIEU adds bilious diarrhœa, explaining that the several ingredients are usually commingled, and that the name is given in accordance with the one that predominates. 1, Of mucous diarrhœa there are three varieties: A, from reflex action; B, from direct irritation; C, from inflammation. 2. Of serous diarrhœa there are three varieties: A, from general disturbance of innervation; B, from epidemic infection; C, by metastasis. 3, Albuminous diarrhœa also has three varieties, based on the source of the albumen: A, from the presence of blood; or B, of pus; C, from transudation of the blood serum, (plasma.) 4. Alimentary diarrhœa is divided into two varieties: A, lientery; B, chylous diarrhœa. 5, Bilious diarrhœa is not subdivided. I have elsewhere stated the objections to any classification based like this upon the ingredients of the stools, (p. 274, *supra*,) to which it is unnecessary here to add further comment.

† *Supra*, p. 62.

‡ Thus, Assistant Surgeon GEORGE WINCH, 29th Wisconsin volunteers—*Camp diarrhœa, near Vicksburg*, The Chicago Med. Journ., Vol. XX, 1863, p. 344—in describing chronic diarrhœas observed in General Grant's army before Vicksburg, writes, June 22, 1863: "There have been a number of cases within the last few days with hæmorrhage from the bowels, without much pain. The stools are large and frequent, it soon brings on lassitude and debility, unless checked, in which I have found no difficulty. But I am informed in another brigade, near by, many such cases prove fatal." He lauds the effects of opium, combined with acetate of lead, tannin or alum, especially the latter, in the treatment of these cases.

variously admixed with blood and containing little or no feculent matter, alternated with stools composed chiefly of the latter ingredient. Sometimes, especially when hard bread formed a considerable portion of the diet, the stools appeared to be in a condition of actual fermentation. They were passed frothy and full of bubbles of gas, which continued to be developed and escape for some time after the matter was discharged. As the disease advanced the stools often acquired a more putrescent character, becoming dark-colored and exceedingly offensive.

On microscopic examination the degree of purulent admixture in the stools is readily determined by the proportion of pus corpuscles, which are almost always present in these chronic cases in smaller or larger numbers. The mucous corpuscles, so-called, have the same characters,* but are readily distinguished by the physical properties of the mucous masses in which they are entangled. The presence of blood is always recognizable by the more or less altered blood corpuscles, which can often be detected by the microscope, when an admixture of blood would not have been suspected from the appearances observed with the naked eye. The minute spherical and rod-like bacteria and other low vegetable forms, already described as occurring in the healthy stools as well as in the discharges of acute diarrhœa and dysentery,† are present of course in countless numbers in the stools of patients suffering under chronic fluxes.

To what has already been said on the subject I will here only add a few words with regard to the occurrence of the characteristic fungi of fermentation in the lienteric stools, especially of those patients in whose diet hard bread forms a prominent ingredient. Of these the common yeast fungus is the usual form; it makes its appearance whenever the digestive process is so far impaired that the grape sugar, formed at the expense of the amyloid matters of the food, goes over into acetic acid fermentation. This condition, as is well known, sometimes occurs in the stomachs of dyspeptic patients, giving rise to the so-called yeasty vomiting. In such cases occurring in chlorotic girls, Frerichs not only demonstrated the presence of acetic acid in the vomited matters and showed that the escaping bubbles consisted of carbonic acid gas, but detected the presence of the yeast fungus in enormous quantities.‡ Now the very same condition often occurs in the stools when intestinal digestion is gravely impaired, as so frequently happens in chronic fluxes. The stools are in a true state of fermentation, and the epithet yeasty may be as properly applied to them as to the vomited matters in which a similar condition exists. Frerichs has also shown that in certain conditions of impaired digestion lactic acid fermentation attacks the starchy ingredients of the food, forming at their expense a tough mucous-like mass with the simultaneous development of lactic and butyric acid. He observed this process in the vomited matters of certain dyspeptics. It can also sometimes be recognized in the stools of patients laboring under the chronic fluxes in which the lactic acid fungus then appears, often in considerable quantities.

The question of the occurrence in the intestinal contents and discharges from the bowel of animal parasites supposed to cause the disease has been so fully treated in connection with the subject of acute dysentery that nothing further need be said in this place.

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* See p. 355, *supra*.

† *Supra*, pp. 278 and 367.

‡ F. TH. FRERICHS—*Verdauung* in Wagner's Handwörterbuch der Physiol., Bd. III. Abth. I, Braunschweig, 1846, S. [illegible]—"Die enorme Quantität der Hefepilze, die Entwicklung der Kohlensäure spricht dafür, dass in solchen Fällen wahre Gährung stattfindet, welche mit der Bildung von Essigsäure ihr Ziel erreicht."

The stools vary in number from two or three to fifteen, twenty or more, in the twenty-four hours. The smaller numbers are most common, but are apt to alternate with periods of greater frequency. Periods of constipation also occasionally occur, especially in the early stages; this sometimes happens spontaneously, sometimes results from the injudicious use of astringent medicines; in either case it is usually followed by a renewal of all the symptoms with increased severity. Sometimes the stools are quite painless; more frequently they are accompanied with a certain amount of colicky pain, and sometimes with a good deal of tenesmus. The latter symptom is very variable, and bears no relation to the extent to which intestinal ulceration exists.

*Ructus and flatus.*—Belchings of gas, rumbling in the bowels and the escape of flatus per anum, with or without concomitant sound, are annoying symptoms which very often accompany the loose discharges in the chronic fluxes or vex the patient at intervals between the stools; not unfrequently also a sense of oppression or of uncomfortable abdominal distension results from the accumulation of gas in the stomach and bowels. These symptoms occur also in acute dysentery, as has already been mentioned, but do not usually attain the degree of prominence which is common in the chronic cases. Notwithstanding the numerous works devoted wholly or partly to the consideration of flatus in health or disease, I am not acquainted with any analyses of the flatus of dysenteric subjects. Its nature and origin can, however, be approximately understood if we bear in mind the composition of the gases found in the normal alimentary canal and the sources from which they are derived.

The earliest attempt at the analysis of these gases appears to have been made by Van Helmont,* who observed that the gas which rises from the stomach during eructations extinguishes the flame of a candle, while that which escapes per anum takes fire if a candle be held to it; observations which are substantially correct and which modern chemistry explains. Additional observations were published in the latter part of the last century by Jurine of Geneva,† and at the beginning of this by Lameyran and Frémy and by Vauquelin.‡ But our present notions are based chiefly upon the analyses of the gases found in the alimentary canal of executed criminals by Magendie and Chevreul,§ and the recent investigations

* Van Helmont—*De Flatibus*, § 48 and 49, Ortus Medicinæ, Amsterdam, 1648, p. 421—"Quod ructus, sive flatus originalis in stomacho, prout et flatus Ilei, extinguant flammam candelæ. Stercoreus autem flatus, qui in ultimis formatur intestinis, atque per anum erumpit, transmissus per flammam candelæ, transvolando accenditur, ac flammam diversicolorem, Iridis instar exprimit. Qui verò in Ileo, sive intestinis gracilibus formatur, nunquam est inflammabilis, sæpe inodorus est, nisi alterius misturam secum deferat, non rarò acer, acutus, pontiensque lancinat in ano." See also the English translation of this work under the title Oriatrike or Physick Refined, London, 1662, p. 424, *Of Flatus's or Windy Blasts in the Body.* According to J. P. Frank—*De Curand. Hom. Morb. Epitome*, Ed. nov., Milan, 1832, T. IV, p. 44—the observations of Van Helmont have long been confirmed, in part at least, by certain boyish pranks: "Puerorum petulantia, diu ante chemicorum recentiorum circa indolem hydrogenii, in crassis intestinis contenti, experimenta, tensis circa nates feminalibus, flatus ano explosos inflammabilis naturæ esse, admoto lumine, docuerat." Whether this experiment is known to the boys of the present day may be left for the reader to decide.

† Jurine's essay—*Déterminer quels avantages la Médecine peut retirer des découvertes modernes sur l'art de connoître la pureté de l'air par les différens Eudiomètres*, Mém. de la Soc. de Méd., T. X, 1789, p. 19—which was crowned by the Society of Medicine of Paris, contained (p. 77) the analysis of the intestinal gases of a lunatic found dead of cold, and examined immediately after, which he compared with the flatus escaping per anum from a healthy subject, collected while in the bath.

‡ Lameyran et Frémy—*L'analyse des gaz formés dans l'estomac des herbivores par la maladie connue sous le nom de météorisation*, Bull. de Pharmacie, T. I, Paris, 1809, p. 338—analyzed the gas obtained by puncturing the abdomen of a tympanitic cow, and Vauquelin—see p. 3 of the thesis of Chevillot, cited *infra*—the gas found in the abdomen of an elephant which died at the Jardin du Roi in 1817.

§ Magendie—*Note sur les gaz intestinaux de l'homme sain*, Annales de Chimie et de Physique, T. II, 1816, p. 292. Three subjects were examined, in only one of which the stomach contained enough gas for examination. The general results were that the stomach contained oxygen and nitrogen, carbonic acid and hydrogen. The oxygen existed in smaller proportion to the nitrogen than in atmospheric air; it disappeared in the small intestine, and was not found in the large. On the other hand, the carbonic acid was more abundant in the small intestine than in the stomach, and still more abundant in the large intestine. The hydrogen was much more abundant in the small intestine than in the stomach, but existed in greatly diminished quantity or was altogether absent in the large intestine. The nitrogen existed in diminished quantity in the small intestine, but was more abundant in the large. Carburetted hydrogen and traces of sulphuretted hydrogen were present in the large intestine only. The gas in the stomach he regarded as chiefly composed of atmospheric air swallowed with the food, the intestinal gases as chiefly derived from the fermentation of the intestinal contents. The analyses on which these conclusions are based were made with the assistance of Chevreul—*Op. cit.*, p. 293. See, also, F. Magendie—*Précis Élémentaire de Physiologie*, 4me Édit., Paris, 1836, T. II, p. 88 *et seq.*

of Planer and Ruge.* From these investigations it would appear that more or less atmospheric air is constantly carried into the stomach with the ingesta,† where its oxygen is absorbed and replaced by carbonic acid derived from the blood in the proportion, according to Planer, of two volumes of the latter to one of the former. No gas is formed in the stomach during normal digestion. The gases from the stomach are carried by the peristaltic motion into the small intestine, where the remaining oxygen is speedily replaced by carbonic acid in the same way as in the stomach, and where also an additional quantity of carbonic acid and

* PLANER—*Die Gase des Verdauungsschlauches und ihre Beziehungen zum Blute*, Sitzungsberichte der math.-naturwiss. Classe der k. Akad. der Wiss., Bd. 42, Vienna, 1861, S. 307. Abstracts of this important paper will be found in the *Zeitschr. für Rat. Med.*, Bd. XIII, 1862, S. 274, and in the Oest. Zeitschr. für Prakt. Heilkunde, Jahrg. VII, 1861, S. 408. The investigations were made chiefly on dogs killed for the purpose, but he also analyzed the gases of the intestinal canal of three human subjects dead of disease. Two died of lung tuberculosis associated with intestinal catarrh; the third had an old stricture of the sigmoid flexure with dilatation of the colon and part of the small intestine. He found no carburetted hydrogen in the alimentary canals of dogs, and only in one of the human subjects, viz: that in which the stricture of the large intestine existed. In this case he attributed its presence to fermentations favored by the long retention of the food in the intestinal canal. In the two human stomachs examined he found an excess of carbonic acid and a quantity of hydrogen, both of which he suggests (S. 339) may possibly have been formed after death. The following are the results of PLANER'S analyses of the gases of the alimentary canal in these three human subjects:

| | Stomach. | | | Small intestine. | | | Large intestine. | | |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_2$ | H | N | $CO_2$ | H | N | $CO_2$ | N | $C_4H_4$ |
| 1st human subject | 20.79 | 6.71 | 72.50 | 16.23 | 4.04 | 79.73 | 30.64 | 69.36 | ..... |
| 2d human subject | 33.83 | 27.58 | 38.22 | ..... | ..... | ..... | 34.80 | 65.20 | ..... |
| 3d human subject | ..... | ..... | ..... | 32.27 | 35.55 | 31.63 | 24.19 | 50.29 | 12.85 |

E. RUGE—*Beiträge zur Kenntniss der Darmgase*, Sitzungsberichte der math.-naturwiss. Classe der k. Akad. der Wiss., Bd. 44, Abth. 2, Vienna, 1862, S. 739—examined the gas which escaped per anum in healthy individuals with the following results in seven trials:

| | Person A. | | | | Person B. | | Person C. |
|---|---|---|---|---|---|---|---|
| | I. | II. | III. | IV. | V. | VI. | VII. |
| Carbonic acid | 14.94 | 40.51 | 21.86 | 12.77 | 21.59 | 54.12 | 11.87 |
| Nitrogen | 45.31 | 17.50 | 44.42 | 43.10 | 41.82 | 22.45 | 40.69 |
| Light carburetted hydrogen | 39.75 | 19.77 | 32.93 | 44.13 | 17.52 | 8.67 | 47.44 |
| Hydrogen | ..... | 22.22 | 0.79 | ..... | 19.07 | 14.76 | ..... |

Oxygen, heavy carburetted hydrogen and ammonia were not found in any case, and only traces of sulphuretted hydrogen, even when the flatus smelled badly. In an individual who had taken eight grammes of milk of sulphur during the day, and whose flatus smelled strongly the quantity of sulphuretted hydrogen was determined by Bunsen's method, and found to amount to but 6 parts in 100,000. The person A in the above experiments gave the following results when fed upon special diets:

| | Milk diet. | | Vegetable diet. | | | | | Flesh diet. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1st series. | | | 2d series. | | | | |
| | After 48 hours. | After 72 hours. | After 48 hours. | After 72 hours. | After 96 hours. | After 48 hours. | After 72 hours. | After 24 hours. | After 48 hours. | After 72 hours. |
| Carbonic acid | 16.82 | 9.06 | 34.00 | 28.40 | 21.05 | 35.43 | 17.6 | 13.62 | 12.46 | 8.45 |
| Nitrogen | 38.38 | 36.71 | 19.11 | 10.07 | 18.96 | 21.78 | 32.2 | 45.96 | 57.87 | 64.41 |
| Light carburetted hydrogen | 0.92 | ..... | 44.57 | 49.36 | 55.96 | 42.79 | 50.2 | 37.41 | 27.58 | 26.45 |
| Hydrogen | 43.88 | 54.23 | 2.31 | 1.57 | 4.03 | ..... | ..... | 3.01 | 2.09 | 0.69 |

RUGE collected the flatus of living dogs in the same way and found therein no light carburetted hydrogen, the results agreeing with the observations of PLANER on this animal.

† This was known even in the Hippocratic era. See the treatise *De Flatibus*, [Περὶ Φυσῶν, Ed. Littré, VI, 101]—"When the body fills itself with food, it fills itself also with air." In modern times this fact has been particularly insisted upon by LITTRÉ—*Sur l'hydropisie tympanite*, Hist. de l'Acad. Royale des Sci., Année, 1713, Paris, 1739, p. 19. HALLER—*Elementa Phys. Corp. Humani*, T. VI, Lausanne, 1777, p. 206—remarked: "Sed omnino ære per os inter deglutiendum recepto, uti aquam, qui submergantur, deglutiunt." See also MAGENDIE—*Mem. sur la déglutition de l'air atmosphérique*, Mém. de la Soc. Méd. d'Émulation, 8me Année, 1me Partie, 1817, p. 103; and BRESLAU—*Über Entstehung und Bedeutung der Darmgase beim neugeborenen Kinde*, Monatsschrift für Geburtskunde, Bd. 25, 1865, S. 238, and Bd. 28, 1866, S. 1. According to this author the alimentary canals of infants who have never breathed contain no gas. With the first respiratory movements, however, movements of swallowing begin. Even before the child begins to take nourishment the air is thus introduced as far as the colon in about twelve hours after the first efforts at swallowing.

an equal volume of hydrogen are set free as products of the chemical changes of digestion. In the contents of the large intestine this process is replaced by a modified form of fermentation of which carbonic acid is the most constant product, although under certain circumstances hydrogen and light carburetted hydrogen are also generated in considerable quantity, and traces of sulphuretted hydrogen often make their appearance, especially in individuals who make use of animal food.

The gases which escape per anum in the healthy condition of the human subject have been analyzed by Marchand and Ruge* and shown to consist of carbonic acid, nitrogen, light carburetted hydrogen and hydrogen, in proportions which, according to the latter observer, vary with the diet. Hydrogen is the most abundant ingredient during the use of milk diet, light carburetted hydrogen during vegetable diet, and nitrogen during flesh diet; ammonia was not found by Ruge in any case, and only traces of sulphuretted hydrogen. That variations of diet are accompanied by variations in the quantity of the flatus is an old observation which dates back to the Hippocratic era.†

The precise nature of the fermentations by which gases are developed in the intestines during healthy digestion still demands further investigation. Frerichs‡ suggested that in the digestion of the starches their transformation into sugar was followed by the conversion of a part of the latter into lactic acid, some of which broke up into butyric acid and equal volumes of carbonic acid and hydrogen, while the production of carbonic acid in the large intestine is probably due to acetic fermentation. But Planer§ searched in vain for butyric or acetic acid in the intestinal contents, or in the products of their decomposition out of the body in closed vessels. Gerardin and Magendie‖ found that an empty knuckle of intestine, included between two ligatures and returned to the abdominal cavity, became after some hours distended with gas; which would seem to show that the gases of the blood may transude into the intestinal cavity independently of any interchange with gases already present. This result was confirmed by Frerichs,¶ and the negative observations of Planer** are not

* Marchand—*Jour. für Prakt. Chemie*, Bd. XLIV, S. 10; I cite from Wagner's Handwörterb. der Physiol., Bd. III, Braunschweig, 1846, S. 869—made two analyses with the following results:

| | $CO_2$ | N | H | $C_2H_4$ | SH |
|---|---|---|---|---|---|
| 1st analysis | 44.5 | 14.0 | 25.8 | 15.5 | 1.00 |
| 2d analysis | 36.5 | 29.0 | 13.5 | 22.0 | ..... |

See note *, p. 489, *supra*, for the analyses of Ruge.

† Thus Hippocrates—*De Victus Ratione in Morb. Acut.*, [Ed. Littré, II, p. 483 *et seq.*]—attributed the quality of inducing flatulence to garlic, cheese, pulse, goats' flesh, &c. See also Celsus—Lib. II, Cap. 26, [Lee's transl., Vol. I, p. 136,]—De his, quæ inflant.

‡ Frerichs, p. 865 of work cited, note ‖ p. 375, *supra*, gives the following formula for this supposed reaction:

$$C_{12}H_{12}O_{12} = 2\,(C_6H_5O_5) + 2\,HO = C_8H_8O_4 + 4\,(CO_2) + 4\,H.$$

§ *Op. cit.*

‖ Gerardin—*Rech. phys. sur les gaz intestinaux*, Paris Thesis, No. 15, 1814. According to this writer (p. 24) Schuylius performed this experiment on the duodenum, and regarded the development of gas in the included knuckle as a confirmation of the opinion of Sylvius that the intestinal gas is produced by an effervescence between the bile and the pancreatic juice. Combalusier, however, pointed out that the experiment would succeed equally in any part of the intestine, and the same results were obtained by Belg and Gleeson. In the experiments performed by Gerardin with the coöperation of Magendie, after tying the first ligature, the intestinal contents were gently pressed downwards by the fingers before applying the second, and, the intestine having been returned, the animal was left to itself from four to nineteen hours. In one instance the animal was killed and the loop examined two hours after the operation, but no gas was found. Gerardin cited the tympanitic distension of the intestine in certain cases of strangulated hernia as a parallel case, and regarded this exhalation of intestinal gas as "une véritable fonction vitale." The same doctrine had been maintained by H. B. Gaspard—*Diss. phys. sur la gazéification vitale*, Paris Thesis, No. 79, 1812. The arguments in favor of it have been well summed up by Piorry—Art. *Pneumatose* Dict. des Sci. Méd., T. XLIII, Paris, 1820, p. 342.

¶ Frerichs, *loc. cit.*

** Planer—p. 345, *op. cit.* on p. 489—was not satisfied with pressing out the intestinal contents, but washed out the loop included between the ligatures, lest the fermentation of any remainder might generate gases. None were formed; but the value of this negative result is diminished by the fact that he only waited two hours before he killed the animal and examined the ligated part. This result was precisely what Gerardin found under the same circumstances. In other experiments Planer filled the intestinal loop with atmospheric air and hydrogen. After an hour and a half he found in the first case a part of the oxygen replaced by an equal volume of carbonic acid; in the second, a part of the hydrogen replaced by carbonic acid in the proportion of four volumes of the former to one of the latter.

sufficient to prove that this process may not occur to a limited extent. The chief source of the intestinal gases in health is, however, undoubtedly to be sought in the chemical processes going on in the intestinal contents during the progress of digestion, and in the modifications which these processes undergo in disease we must seek the origin of the more abundant and offensive gases which are developed in the course of the various diseased conditions of the alimentary canal.

Numerous works were formerly devoted to the discussion of this subject,* but since chemistry has been sufficiently advanced to permit exact investigations, comparatively few have been undertaken. Since the publication of the observations of Chevillot,† indeed, I know no attempt at a systematic examination of the intestinal gases in disease. The precise nature of the changes in composition which the intestinal gases undergo in chronic dysentery therefore remains a matter of uncertainty. It is probable enough that a considerable increase takes place in the amount of carbonic acid gas eliminated during the digestion of the starches both in the stomach and in the intestines. The copious tasteless or acid eructations‡ sometimes complained of are probably of this nature, and the same gas is undoubtedly present in large quantities in the flatus which escapes per anum in lienteric cases fed largely on amylaceous diet. But the extremely offensive eructations and flatus, which are common enough in these cases, as Cælius Aurelianus§ long ago observed, suggests other chemical processes of a more putrefactive character, and as to the nature of these nothing definite is known.

Tympanitic distension of the abdomen often occurs in the course of chronic fluxes, especially during occasional intervals of constipation and a short period before the fatal issue. This distension is produced for the most part by accumulations of flatus in the large intestine, sometimes also in the small, or in both, determined by diminished power or actual paralysis of the muscular coat of the bowel, which, hence, fails to expel the flatus; by spasmodic contraction of the circular muscular coat at some point above which the accumulation takes place, or by obstruction resulting from other causes.

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* From among the numerous works which treat of this subject, I cite a few prominent references in addition to those already given: GALEN—*Ad Glauconem de methodo medendi*, Lib. II, Cap. 8, [Ed. Kühn, XI, 111,] and *Com. III in Hippoc. de Humoribus Lib.*, § 13, [*Id.*, XVI, 391] as well as many other places. ÆTIUS—*De inflatione*, Tetrab. III, Serm. 1, Cap. 27, Leyden Ed., 1549, p. 565. PAUL'S ÆGINETA—*On inflation of the stomach*, Lib. III, Cap. 38, Transl. of Syd. Soc., London, 1844, Vol. I, p. 514. SENNERTUS—*De ructatione*, Pract. Med., Lib. III, Pars 1, Sect. 2, Cap. 11; *De oritis à flatibus, etc.*, ib., Pars 2, Sect. 2, Cap. 2; *De tympanite*, ib., Pars 6, Sect. 2, Cap. 4, Opera, Paris, 1641, T. III, pp. 55, 101 and 359. J. FIENUS—*De flatibus humanum corpus molestantibus commentarius novus ac singularis*, Antwerp, 1592; and a translation of the same by W. ROWLAND, London, 1678, entitled *A New and needful Treatise of Wind offending Man's Body*. J. A. KÜLBEL, [G. E. STAHL, præside.]—*De p. de flatulentia* Halle, 1708. FRID. HOFFMANN—*De flatulentia ventriculi et intestinorum, et affectione tympanitica*, Med. Rat. Systemat., T. IV, Pars IV, Cap. 15, Opera, Geneva, 1740, T. III, p. 339. G. VAN SWIETEN—*Ructus et flatus*, Commentaria, T. II, Leyden, 1745, p. 232, § 646 *et seq.* F. DE P. COMBALUSIER—*Pneumato-Pathologia*, Paris, 1747. SAUVAGES—*Nos. Meth.*, Amsterdam, 1768, T. II, 413—embraced, under the order aeriflaxus, three genera—flatulentia adepsophalos flatulence of the genitalia, male and female] and dysodia, [including fetid breath and exhalation of fetid odors from the axilla, feet, groins and vulva.] Emphysematous swellings of the skin he includes in the genus pneumatosis [*op. cit.*, p. 468] of the order intumescentiæ, class cachexiæ. Tympanites he makes a genus of the order hydropes partiales, same class. [*op. cit.*, p. 513.] C. F. KADELBACH—*Tympanitidis Pathologia*, Leipsic, 1772. G. S. RICHTER—*De tympanitide*, Strasburg, 1783. WM. SCULLY—*Diss. de tympanitide*, Edinburgh, 1801. J. P. FRANK—*De Cur. Hom. Morb. Epitome*, Lib. VI, Pars I, § 701 *et seq.*, Milan Ed. of 1832, T. IV, p. 30—applied the designation pneumatosis, introduced by SAUVAGES, to all accumulations of gas in the body whether in the alimentary canal, the closed cavities or the cellular tissue; and in this he was followed by several subsequent writers *e. g.* PIORRY—Art. *Pneumatose*, Dict. des Sci. Méd., T. XLIII, Paris, 1820, p. 342, and CHOMEL—Art. *Pneumatose*, Dict. de Med., 2me Ed., T. XXV, Paris, 1842, p. 127. PORTAL—*De la pneumatie*, Mém. sur la nature et le traitement de plusieurs maladies, T. V, Paris, 1825, p. 91. P. E. FODÉRÉ—*Essai théorique et pratique de pneumatologie humaine*, Strasburg, 1829. M. P. BAUMÉS—*Lettres sur les causes et les effets de la présence des gaz ou vents dans les voies gastriques*, Paris, 1832. BAMBERGER—*Gasansammlung*, in Virchow's Handb. der Spec. Path. u. Ther., Bd. VI, Abth. 1, Erlangen, 1855, S. 275. COPLAND—Art. *Flatulency*, in Dict. of Pract. Med., Vol. I, London, 1858, p. 1013.

† CHEVILLOT—*Recherches sur les gaz de l'estomac et des intestins de l'homme a l'état de maladie* Paris Thesis, No. 191, 1813—analyzed the intestinal gases of a number of subjects dead of various diseases. Unfortunately the peculiar manner in which the results are grouped impairs their usefulness, no single complete analysis being given in the essay. Moreover, the gas was seldom collected till some hours after death, often as late as twenty-four hours. A good abstract of this paper will be found in the Archives Gén. de Méd., T. V, 1834, p. 285.

‡ According to HIPPOCRATES, acid eructations in chronic lientery are a favorable sign if the patient has not previously been subject to them. *Aphorisms*, VI, I, [Ed. Littré, IV, p. 563.]

§ *Loc. cit.*, p. 484, *supra*. During the recent French occupation of Mexico this symptom arrested the attention of PONCET—*Des cas de dysenterie qui ont régné dans le corps expéditionnaire du Mexique*, Recueil de Mem. de Med. Chir. et Pharm. Militaires, T. IX, 1864, p. 258—who has also noted the occurrence of eructations, often smelling of sulphuretted hydrogen, in the course of the camp diarrhœas at Orizaba.

The older physicians believed also that in tympanites* the accumulation of gas often occupied the peritoneal sac. This undoubtedly happens in cases of perforation of the intestine, the flatus being readily expelled through the opening by the intestinal contractions. Under such circumstances I have several times observed considerable accumulations of gas in the peritoneal cavities of subjects dead of dysentery and dissected very soon after death. Accumulations of gas in the peritoneal sac may also frequently be observed when dissection is postponed long enough after death for the putrefactive processes to commence before the abdomen is opened. Perhaps under these circumstances, besides the development of gas during the putrefactive process, the intestinal gases already present may be diffused through the thin intestinal walls into the peritoneal sac. Perhaps, also, under certain conditions gas may be developed during life in the peritoneal sac, as the ancients believed, independently of intestinal perforation or the introduction of gas from without in any other manner. I have never myself seen an example of this accident, which, however, according to Rokitansky and Bamberger,† is occasionally observed, the gas being disengaged from ichorous purulent fluids in certain cases of peritonitis.

*Abdominal tenderness.*—An examination of the abdomen will very often detect more or less tenderness on pressure along the course of the colon. This is sometimes greatest on the right side over the cæcum, sometimes on the left over the descending colon; sometimes, however, it follows the whole line of the colon; in other cases there is general abdominal tenderness. These symptoms are not unfrequently an indication of the existence of local or general peritonitis, as will be shown further on.

*Disordered digestion.*—The disturbed condition of the digestive functions is betrayed by various other symptoms besides those already mentioned.

The *appetite* is almost always disordered: sometimes it is diminished, in extreme cases a positive loathing of food existing; sometimes it is abnormally increased; in other cases it is capricious, the patient craving some particular article of food only. Very often, although he loaths camp diet, he can be tempted to eat by dainties or indeed by ordinary food if well cooked. In those cases in which a scorbutic taint exists a craving for fresh

* Tympanites was spoken of in the Hippocratic writings as dry dropsy, [ὕδρωψ ξηρός,] *Aphorisms*, IV, 11, [Ed. Littré, IV, 505,] and *Prenotions of Cos*, § 298, [*Id.*, V, 651.] Two kinds of dropsy are recognized in these writings—the one consisting in accumulations of fluid. [ὑδρωψ ὑποσαρκίδιος, anasarca,] the other in accumulations of gas, [ἐμφύσημα, emphysema.] See *De Victus Rat. in Morb. Acut.*, Appendix, § 20, [*Id.*, II, 497.] In his commentary on this latter passage GALEN calls the second variety tympania, [τυμπανίας,] *Com. IV in Lib. de Acut. Morb. Vict.*, § 93, [Ed. Kühn, XV, p. 891.] On the diagnosis between these two species see GALEN—*De Dignoscendis Pulsibus*, Lib. IV, Cap. 3, [*Id.*, VIII, 951,]—who especially insists upon the drum-like sound evoked by percussion, whence the second variety derives its name. The flatus might accumulate not merely in the alimentary canal but also between the coats of the intestines—*Meth. Medendi*, Lib. XII, Cap. 8, [*Id.*, X, 863,] or in the peritoneal cavity itself—*Meth. Medendi*, Lib. XIV, Cap. 7, [*Id.*, 963.] Compare SENNERTUS—*De tympanite*, Pract. Med., Lib. III, Pars 6, Sect. 2, Cap. 4, Opera, Paris, 1641, T. III, p. 339—by whom the older views are pretty fully discussed. This conception of the subject survived till near the close of the last century. We find it in the nosology of SAUVAGES—*Nos. Meth.*, Amsterdam, 1768, T. II, p. 513 *et seq.*—who classes "tympanites" as a genus of the order Partial dropsies. The species are: 1, t. intestinalis; 2, t. abdominalis; 3, t. enterophysodes. [emphysema of the intestines or abdominal viscera:] 4, t. asciticus; 5, t. spasmodicus; 6, t. Stwartii, [an acute form supervening on rupture of the gall-bladder;] 7, t. verminosus. According to SAUVAGES, meteorismus, which he made a separate genus of the same order, differs from tympanites in its fugitive nature, in the circumstance that it accompanies acute diseases, or in affecting only a part of the abdomen. The species are: 1, m. ventriculi; 2, m. abdominis; 3, m. hystericus; and 4, m. à manzanillâ, [a result of poisoning by the manchineel tree.] The word Meteorismus is derived from the Greek *μετέωρος*, [elevated, raised,] concerning whose use by HIPPOCRATES and GALEN, as applied to superficial pains, swellings, etc., see the article *μετέωρον* in the dictionary of GORRÆUS—*Def. Med.*, Paris, 1622, p. 398. I find the word meteorismus used in nearly the same sense as by SAUVAGES in the *Pneumato-Pathologia* of COMBALUSIER, Paris, 1747, p. 7: "Si a collectis flatibus ventriculus et intestina derepente ita turgeant, ut exinde præter modum, ac præsertim hypochondria versus, intumescat, et quasi in sublime tendat abdomen; hæc acuta, nec ultra limites morborum hujus indolis extensa intumescentia, sive dolorem comitem habeat, sive ejusdem expers sit, meteorismus late vocari consuevit." CULLEN, (1769,) separated meteorism and tympanites from the dropsies, and included both in the genus tympanites, which, with the genera pneumatosis and physometra, he made a section of the order intumescentiæ, [Works, Thomson's Ed., Edinburgh, 1827, Vol. I, p. 322.] CULLEN threw doubts on the occurrence of collections of gas between the intestinal coats as a primary disease, suggesting that they occurred only as a consequence of erosion of the internal coat by ulceration. He also regarded the accumulation of gas in the peritoneal cavity as very rare; "but, from several dissections, it is unquestionable that such a disease has sometimes truly occurred," [*op. cit.*, Vol. II, p. 575; see also *First Lines*, Ed. of 1784, Vol. IV, p. 231.] Consult also the article *Tympanite*, in Dict. des Sci. Méd., T. 56, Paris, 1821, p. 162, to which is appended a list of some two dozen theses on tympanites, in two of which—that by VEHR, Frankfort, 1686, and that by VATER, Wittenburg, 1713—it figures under the old designation hydrops siccus. See also J. G. PLENKER—*Diss. de meteorismo*, in J. EYEREL's *Dissertationes Medicæ*, Vienna, 1790, T. III, p. 92.

† C. ROKITANSKY—*Lehrb. der Path. Anat.*, 3te Aufl., Bd. III, Vienna, 1861, S. 146; BAMBERGER, S. 238 *op cit.*, note *, p. 491.

vegetables, pickles, fruit and acid or subacid drinks become a marked symptom. Uneasy feelings or pains in the stomach often follow meals, and the use of particular articles of diet, which prove especially indigestible to the individual patient, provokes an increase in the frequency of the stools as well as increased pain and flatulence.

The *tongue* is seldom natural: in many cases it is simply coated with a more or less thick whitish fur; in others it is pale, smooth, swollen and indented on the edges by the teeth; perhaps the latter is the most characteristic condition in those cases especially in which evidences of a scorbutic taint are present. Towards the close of fatal cases the tongue assumes other characters: sometimes it becomes brown and dry as in typhoid fever, in other cases it acquires a bright-red color and appears smooth and shining like a piece of raw beef; on the shining red surface aphthæ sometimes make their appearance.

*Debility and emaciation.*—The most characteristic feature in the constitutional condition of patients suffering from chronic dysentery is a steadily increasing debility accompanied by progressive and ultimately extreme emaciation, the expression, as Aretæus* long ago pointed out, of the impaired nutrition resulting from the disordered condition of the digestive functions. Very often the patient is not confined to bed till he has been sick quite a long time. Indeed he not unfrequently remains with his regiment and carries the musket until the disease has made considerable progress. Sooner or later, however, he breaks down and finds his way to general hospital. In hospital he very often does not keep his bed except during intercurrent acute attacks until near the fatal issue, but his walk becomes progressively feebler, the slightest exertions provoke palpitations, pantings, and are followed by extreme fatigue, while the emaciation steadily progresses and ultimately attains an extreme degree which is but rarely encountered in other affections.

Meanwhile the complexion acquires a pallid hue; the facial bones project, the eyes sink, giving a ghastly expression to the countenance; the skin of the general surface of the body becomes dry, in advanced cases a desquamation of the cuticle in bran-like scales occurs;† the spirits are much depressed, the patient takes a gloomy view of his prospects; very often he falls into a condition which is best described as general nervousness; in other cases the mental condition assumes the form of nostalgia; in others it approaches imbecility;‡ delirium, however, is rare even in extreme cases. The voice shares in the general debility, it becomes feeble and measured; sometimes it has a peculiar muffled sound as if heard from a distance. These conditions are frequently modified by the presence of the *malarial cachexia*, or the *scorbutic taint;* the former is indicated by an icteroid hue of the conjunctivæ and skin, enlarged spleen, a tendency to periodicity in the phenomena of the disease,

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* *Loc. cit.*, p. 484, *supra.*

† DE BRULER (*supra*, p. 42) observed in the latter stages of many of his cases that the abdomen became covered with drab or copper-colored spots, varying from the size of a split pea to that of a dime or even a quarter of a dollar. This observation recalls the eruptions described by FINGER—see note † to p. 409—and ZIMMERMANN—see note ‖ to p. 412, *supra.*

‡ W. KEMPSTER—*Entero-colitis, or chronic diarrhœa*, The Amer. Journ. of the Med. Sci., Vol. 52, 1866, p. 337—who has since then attained distinction in the treatment of mental diseases, gives the following graphic account of some of these cases: "There is yet another very distressing affection which sometimes occurs as a result of this disease, and to which I cannot give a name. To those who have suffered long from entero-colitis, or have been subjected to prison diet, it is most marked. I allude to a state of the mind which may with propriety be called mental incapacity. In this condition a feebleness of purpose, a want of stability and incoherence are exhibited. This derangement may continue for some time after the primary disease has entirely left the patients. When a question is asked they hesitate several minutes, apparently endeavoring to find language for an answer which when made is in the fewest words. This was observed particularly, among those men who had been several months in southern prisons, suffering from the effects of entero-colitis, with the scorbutic diathesis. They would sit by the hour, gazing on the ground, paying no attention to what was going on about them. Their movements were slow; they were irritable; nothing would please them. The face wore an expression of complete dejection. The pulse was slow and soft, the pupil dilated, and the eye presented an unusual brightness. They slept very soundly, and for longer periods than a person in health. The appetite was good, and the functions of the body were normally performed. These symptoms were more like those of brain softening in its advanced stage than any others to which I can compare them. *The brain was starved.* In the cases examined after death no pathological condition of the brain or its membranes was found which would account for the ante-mortem state above described." "From this state some recovered entirely; others did not while they remained in hospital."—p. 350.

or an occasional outbreak of actual ague; the latter manifests itself by muddy complexion, large flabby tongue, pseudo-rheumatic pains, hemeralopia, swollen gums and purpuric blotches. Either taint may occur singly, but generally they are variously combined. Not unfrequently indeed one or both precede the original development of the flux.

*Other symptoms.*—The *pulse* is, as a rule, soft, compressible and but moderately accelerated, [85 to 95,] so long as the patient keeps quiet. On exertion of any kind, however, its frequency is greatly increased, merely walking across the hospital-ward proving sufficient in many cases to give it very great rapidity, [120 to 140, or even more.] Cardiac palpitations after exertion are commonly complained of; not unfrequently they take the form of *irritable heart*, so carefully studied by Dr. Da Costa,* who found that of two hundred cases of that cardiac disorder, sixty-one occurred in patients who were suffering or had suffered from diarrhœa. The disease sometimes runs its course without febrile complication, but more or less pronounced hectic fever often accompanies its latter stages; and then increased frequency of the pulse with some rise of temperature is noted in the afternoon and evening, and night sweats become troublesome.

The *urine* very generally presents nothing abnormal; in some cases it is scanty and correspondingly concentrated, in others it is copious, pale and throws down a phosphatic sediment. Sometimes it contains albumen and casts; still more frequently the latter can be detected on careful microscopical examination, although albumen can not be recognized by chemical tests; but neither of these conditions was observed, during the war, as often as might have been expected in view of the number of instances in which the kidneys were found large and pale, fatty or otherwise diseased, after death. The fact is that the urine was very seldom examined in these cases, either chemically or microscopically, unless the renal disease had so far advanced as to produce dropsy; more numerous examinations would undoubtedly have afforded more frequent indications of renal complication. Thus, Prof. Alonzo Clark† investigated the urine of a small number of cases admitted to Bellevue hospital from the army of the Potomac, during the latter part of 1862. He found casts in the urine of all "the bad cases" he examined, as well as in that of some of the convalescents, although no albumen could be detected; in two cases, both of which were convalescent from the flux, the urine was albuminous. *Strangury* and *vesical tenesmus* were not of frequent occurrence in chronic fluxes, except when acute dysenteric symptoms supervened during the progress of the case.

*Prolapsus ani* is not unfrequently a troublesome symptom in chronic cases; it is, however, impossible to determine the number of instances in which this accident occurred during the war. It will be seen by tables CI and CXII, in the First Medical Volume, that 325 white and 7 colored soldiers were discharged the service on account of prolapsus ani, and it is probable that in a considerable proportion of these cases the accident was

* J. M. Da Costa—*On irritable heart*, Amer. Jour. of the Med. Sci., Vol. LXI, 1871, p. 37—judiciously comments on these figures, "Sixty-one cases of diarrhœa, or 30.5 per cent., represent certainly more than a mere coincidence."

† Alonzo Clark—*Proc. of N. Y. Path. Soc.*, in Med. and Surg. Reporter, Vol. IX, 1862-3, p. 312. It is not very clear from this report of Prof. Clark's remarks how many cases he examined; whether all or part of the whole number of patients admitted, which is stated to have been 72, of whom 23 died and 11 post mortem examinations were made. The report reads: "The kidneys were larger than natural, and whitened. In one post mortem they were loaded with oil globules; the urine of non-convalescents in no case contained albumen. When the specimens of urine came to be examined under the microscope, there were only two in which casts were not found. The absence of casts may sometimes be accounted for from the manner in which the examination is made. In all the bad cases casts were found, but no albumen; thus, at least, one of the evidences of Bright's disease may be constantly found in these cases. Of 5 convalescents, 3 had casts. Of 6 convalescents examined quite recently, 2 contained albumen. There was rarely any œdema of the legs, and none of the hands in the bad cases, while 2 that are convalescent have been œdematous though less so now than two weeks ago. Thus the relation of the diarrhœa to Bright's disease is pretty clearly established. If the disease of the intestines provokes the disease of the kidneys they are in the same condition as in pregnant women, or in children with scarlet fever. Thus, they may recover from Bright's disease after the disease which caused it has been removed."

brought about by some form of chronic flux. Usually, however, such cases were reported merely as chronic diarrhœa or dysentery, and there are no statistics to show the actual frequency of the accident in question.

COMPLICATIONS.—It has already been mentioned several times that acute dysentery was a frequent complication in the course of chronic fluxes, and often the precursor of a fatal issue.* So also the circumstance that these fluxes were often complicated by the malarial and the scorbutic cachexias has already been alluded to.† Besides these I may mention rheumatism and pseudo-rheumatism, intermittent fever, remittent and continued fevers, peritonitis, dropsy, pneumonia, chronic bronchitis and phthisis, abscess of the liver, perineal abscess and ulceration of the cornea as among the more important complications which require consideration in this place.

*Rheumatism and pseudo-rheumatism.*—These conditions have already been commented on in connection with acute dysentery.‡ That genuine rheumatism often occurs in patients laboring under chronic fluxes, and that chronic fluxes frequently attack rheumatic subjects, I do not doubt. But undoubtedly also both malarial and scorbutic neuralgia are readily mistaken for rheumatism, and in a large proportion of the soldiers suffering with chronic diarrhœa and dysentery, in whom general debility was associated with the "lame backs" or "weak backs," so common during the civil war, the pains complained of were probably of this nature.§ For these neuralgic conditions, simulating chronic rheumatism, I have proposed the name *pseudo-rheumatism*, and will discuss the phenomena designated by this term in a subsequent chapter.

*Intermittent fever.*—Ordinary ague was a common complication of chronic dysentery,‖ sometimes preceding the flux, sometimes only appearing after it was fairly under way. Periodical febrile paroxysms without chills, the so-called dumb ague, were also of frequent occurrence. Readily cut short by quinine, these intermittent paroxysms were prone to recur obstinately, and undoubtedly exercised an unfavorable influence on the progress of the disease. Paroxysms of pernicious intermittent fever also occasionally occurred during the progress of a chronic flux, and were sometimes the immediate cause of death. Assistant Surgeon J. T. Calhoun, U. S. A., has published five cases of this complication, in three of

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* *Supra*, pp. 350 and 352. † *Supra*, p. 493; compare pp. 288 and 406. ‡ *Supra*, p. 496 *et seq.*

§ Compare with the remarks in the text and those referred to in the last note the following extracts from an address delivered before the Philadelphia County Medical Society by Professor ALFRED STILLÉ, of the University of Pennsylvania—Trans. of the Medical Society of the State of Pennsylvania. Philadelphia, 1862, p. 303. Describing his experience in one of the great military hospitals of that city, he remarks: "The two most extraordinary systemic complications of diarrhœa were malarial cachexia and scurvy." Of the latter he says: "It has shown itself in several instances by œdema of the lower extremities and ecchymosis of these and other parts. No instances of spongy gums and loosened teeth have been noticed by me, but in one case the exacerbations of the swelling and discoloration of the legs were coincident with an increase of diarrhœa and an insufferable fetor of the breath. Œdema of the ankles, without ecchymotic discoloration, was observed in many other cases. It is highly probable that a scorbutic condition often existed when the characteristic symptoms of scurvy were absent; but neither the phenomena themselves nor the effects of treatment positively demonstrated it. As to these effects, it appeared to me that lemon-juice and fresh vegetables, the specific remedies for scurvy, were less efficacious than their reputation led me to expect; nor did it seem possible, in the greater number of cases, to carry the improvement beyond a certain point much below the average of good health. Of these cases it may be said emphatically, as with less positiveness it may be of the other chronic affections already noticed, that comparatively few of them can be expected to recover in the wards of a hospital. They stand pre-eminently in need of fresh air, sunshine, and exercise combined. . . . As closely connected with scurvy, if we may conclude from the conditions in which it is found to exist, *muscular rheumatism* may be mentioned; but it must not be forgotten that the scorbutic diathesis, as a merely debilitating influence, predisposes to all diseases excited by external causes, and leads pre-eminently to rheumatism. The direct causes of the latter affection, indeed, surround the soldier at every step of an active campaign, and it is only a matter of surprise that an army of stalwart men is not speedily converted into a horde of cripples. Out of some scores of cases that have passed under my observation, I do not remember a single one in which the attack began as an acute inflammation. They were, all of them, cases of muscular rheumatism, or else of subacute or primarily chronic rheumatism of the external ligaments of the joints, and often resulted in fibrous anchylosis or in simple atrophy of the affected limb. In some cases of the latter sort the stiffness of the joints yielded to a diligent and persevering use of active and passive motion. A striking example of this result was presented by a man who for months had been bent almost double, but who left the hospital nearly erect." W. KEMPSTER [p. 344, *op. cit.*, p. 493, *supra*] remarks that the most fatal form of chronic diarrhœa is that connected with the scorbutic diathesis. Of this variety he says he believes it "constituted more than two-thirds of all the cases occurring during the last two years of the war. This cachexia is known to exist when we find spongy gums, bleeding on slight pressure. A not unfrequent symptom is hemeralopia, or night blindness, which can frequently be traced to a scorbutic origin, and which will aid in the diagnosis."

‖ Compare the remarks on p. 287, *supra*; the writers cited in this foot-note for the most part refer to chronic fluxes as well as to chronic diarrhœa.

which the life of the patient was saved by the liberal use of quinine.* Lastly, in great numbers of cases, whether distinct ague paroxysms occurred or not, a condition of chronic malarial poisoning was superadded to the cachexia resulting from the flux, and increased both the severity of the symptoms and the probability of a fatal issue.†

*Remittent and continued fevers.*—The existence of a chronic dysentery confers, of course, no exemption from the continued fevers, and as the causes of both groups of diseases continually coexist in camps, the fevers and fluxes very often occur variously combined in the same individual. During the civil war the chronic fluxes were frequently complicated by the development, at some time during their progress, of remittent, typho-malarial or typhoid fevers. When these appeared at an early stage of the bowel affection they often ran their course and terminated in recovery, leaving the patient, however, still suffering from the flux and almost always worse, especially more debilitated, than before. In other subjects the febrile complication determined a fatal issue; and then, on the autopsy, thickening and ulceration of Peyer's patches were very generally found in addition to the lesions of the large intestine characteristic of the flux. Moreover, fevers in the course of which diarrhœa became a prominent symptom, served at times as the starting point of a chronic flux in individuals whose digestive organs had previously escaped disease. Such cases will be more fully discussed hereafter in connection with the subject of fever.

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* J. THEODORE CALHOUN, Surgeon in Chief, 2d Div., 3d Army Corps (afterwards Assistant Surgeon, U. S. A.)—*Rough notes of an Army Surgeon's experience, during the great rebellion*, The Medical and Surgical Reporter, Vol. X, 1863, pp. 49 and 50—"There is another complication not as often recognized as that just referred to, yet little less fatal if it is not. It is an attack of Pernicious Fever, (Wood,) or what is ordinarily known as Congestive Chills. Patients, I am convinced, frequently die with this complication without the disease being suspected, and the death is entered in the monthly report as 'Colica.' Let me detail a few cases that have come under my immediate treatment or notice, premising that I describe them entirely from memory, as I have no data at hand to which I can refer. Case I.—Private Wm. P., Co. E, 5th Excelsior, had been sick for some time with Chronic Dysentery, but was so far convalescent at Harrison's Landing, that he was in his quarters and walking around camp. One day he fainted at the sink and was brought into the Regimental Hospital. He was vomiting, with an expression of countenance indicative of a state of great depression; the features were sunken and cadaveric, and so altered that I hardly recognized him; the pulse was scarcely perceptible; the muscles of his lower extremities were in knots with the cramp. He declared he had eaten nothing but a little toast, and described himself as in his ordinary health when he was suddenly taken with vomiting and faintness. Friction, heat, etc., externally, with sinapisms to the abdomen and calves of the legs, and stimulants freely given internally failed to have any effect, and he died in a few hours. Circumstances precluded a post mortem examination. Case II.—Private Oscar C., Co. C, 5th Excelsior, had been troubled with a little diarrhœa while lying before Alexandria last fall. I was called to see him in his quarters with the report that he had been suddenly taken very ill. He was well known to me, yet I should not have recognized him. His features were perfectly death-like; pulse to be felt but with difficulty; vomiting; cramps and pain, as in the case just narrated. I had him carried to the Regimental Hospital; placed a strong sinapism on his abdomen, directed frictions to his legs and thighs, and gave him brandy and quinine without regard to quantity. He rallied slowly, but it was not until the next day that he began to look like himself, and when we left him at Convalescent Camp, when we moved to Manassas in November, although he had been treated on a tonic and invigorating plan, he was still very feeble. Case III.—Private Andrew B., wagoner, Co. B, 5th Excelsior, was taken the next day after the case above described, and in precisely the same way, and presenting the same symptoms, though not to so marked an extent. He had a similar treatment, but as he was very intractable it was difficult to get him to take all the stimulants desirable. He rallied, and the next morning was much better and walked around. About ten o'clock, after a few yawns and shivers, the train of symptoms re-appeared, and under a like treatment he again rallied. The succeeding day he had a slight attack, but large doses of quinine prevented the reappearance of the disease. Large doses of quinine and a good diet put the patient on duty again in a few weeks. Case IV.— —— ——, 2d Excelsior. The patient was under treatment by Dr. Younglove, Assistant Surgeon of the regiment, for a mild diarrhœa. A few days after the battle of Fredericksburg, he was taken very ill while in his quarters, and died before assistance could be rendered him. His comrades reported that he vomited freely and complained of cramp and pain. By request of Dr. Ash, Surgeon of the Regiment, I attended the post mortem examination several hours after death. The stomach exhibited no traces of inflammation; the lungs were moderately congested, otherwise there was little evidence of pathological changes. Case V.—Private Wm. M., Co. D, 5th Excelsior, was taken as were the patients above described, and under a somewhat similar treatment by Dr. Lodge, Assistant Surgeon 5th Excelsior, he rallied and was convalescing, when on the fourteenth day after the attack he was seized with another turn. He was again fortunate in sustaining it, and the liberal administration of quinine prevented a return of the disease, and in due time he resumed his duties. These, it seems to me, are clearly cases of Pernicious Fever. The comparatively trivial nature of the illness previous to the attack, the suddenness of the attack, the great and alarming prostration, the periodicity so clearly marked in two of the cases, and the recovery under the anti-periodics and stimulants, seem to me to indicate the nature of the complication. I know that deaths from this complication are seen in other regiments, and for want of a better term are put down as colic. The vomiting lends too many to look only to the stomach and bowels and to ascribe the result to something the patient must have eaten, but he will declare to the contrary, and an inspection of the ejecta proves his truthfulness. The patient is poisoned with malaria. There may be something in the condition of the system, the result of this diarrhœa, which renders the patient peculiarly susceptible to the malarial poison, as I am inclined to think, or it may be simply that he receives a large dose of the poison. It is not alone sufficient to stimulate the patient. We must give quinine without regard to quantity; it is best given when there is clearly an intermission, but if there be none the quinine must be given freely, for in that lies the patient's only protection against a second and most probably a fatal attack. As far as my experience goes the liability to attack of Pernicious Fever is the complication of Camp Dysentery by far the most to be dreaded, and it is most effectually guarded against when quinine is used in the treatment of the dysentery."

† Professor ALFRED STILLÉ (cited last page) declared that "the two most ordinary systemic complications of diarrhœa were malarial cachexia and scurvy. The former impressed upon the patient a peculiar sallow or muddy paleness, and seemed to be a common cause of the gastric dyspepsia which so frequently rendered its treatment abortive, or at least prevented remedies from being permanently curative." In many cases he thought the "malarial anæmia is maintained by the chronic disorder of the bowels." W. KEMPSTER (cited on p. 493, *supra*) has also commemorated the complication of camp diarrhœa by intermittent fever, especially among the troops serving in Louisiana.

*Peritonitis.*—Perforation of the intestine followed by fæcal extravasation and acute general peritonitis is an occasional accident, in the course of chronic fluxes dependent on intestinal ulceration, and usually proves fatal. General peritonitis with very similar symptoms may also arise independently of the occurrence of perforation, though this is not so common as in acute dysentery. But usually the peritoneal inflammation that occurs in the course of chronic dysentery is of a more subacute or even chronic character, beginning as a local process limited to some portion of the surface of the large intestine and gradually spreading until it involves the whole peritonæum. Such chronic inflammatory processes give rise to extensive adhesions, together with more or less bulky accumulations of serous, sero-purulent or purulent fluid in the abdominal cavity. This condition constituted one variety of the "swelled bellies" which attracted so much attention during the war. A study of the autopsies recorded has satisfied me that both intestinal perforation and local and general peritonitis, occurring independently of perforation, are more frequent in the chronic cases resulting from diphtheritic dysentery, or complicated by it, than in those dependent upon chronic follicular ulceration of the colon. The same remark applies to those cases in which the peritoneal inflammation and perforation occur in connection with the cæcum, and to which the term typhlitis may be properly applied. Case 193* is an example of this accident, in which death took place before the fæcal abscess had time to open externally. Such cases are rare, and probably even more so in the course of chronic fluxes than in acute diphtheritic dysentery. The occurrence of *tubercular* peritonitis will be referred to hereafter in connection with tubercular ulceration of the intestines.

*Dropsy.*—This symptom in the form of ascites,† with or without œdema of the lower extremities or general anasarca, was by no means an infrequent complication of chronic dysentery, and arose from various pathological conditions. More or less extensive inflammation of the peritoneal surface of the colon, or general peritonitis consecutive to this, giving rise, as mentioned above, to serous, sero-purulent or purulent accumulations in the peritoneal sac, constituted a considerable proportion of these cases. In other instances ascites was the consequence of mechanical obstructions to the circulation, produced by enlarged spleens resulting from the malarial cachexia, or by cirrhosis or other disease of the liver. In still other cases the dropsical effusion was the result of chronic renal disease, and in this class of cases general anasarca was usually developed. There are many reasons for believing that chronic renal disease and liver cirrhosis were sometimes caused by the prolonged action of the malarial influence, as is well known to be the case with the enlarged spleen; under such circumstances more or less advanced disease of all three of these important organs was often variously combined with chronic peritonitis. The appearance presented by patients suffering under this complication was quite striking. The pale or yellow, emaciated countenances, the feeble movements, the bloated bellies and swollen legs made a picture well

* *Supra*, p. 125. Compare the remarks on peritonitis and perforation in acute dysentery, *supra*, p. 388.

† Professor ALFRED STILLÉ, in the address cited on p. 495, remarks: "It has been mentioned in my hearing by more than one hospital surgeon that cases of ascites are common in connection with chronic diarrhœa. My own experience has not furnished me with a single instance of the kind. In some cases of the intestinal disorder distension of the abdomen was occasionally observed, but in all of them it was tympanitic, and appeared sometimes to be produced by the bread, which, being unfermented when eaten, seemed to develop a prodigious quantity of gas during digestion. Tympanites however, sometimes occurred without any apparent intestinal or gastric disorder, or even the least alteration of the general health. In these cases no treatment of it was efficacious." That this opinion should have emanated from one of the best instructed clinical observers in the United States, only serves to make more apparent the danger of drawing general conclusions with regard to a disease such as this from a single group of cases. Those which fell under Professor STILLÉ'S eye, if we may judge from the autopsies made by Professor LEIDY on the Philadelphia cases at the time referred to, were for the most part cases in which there was little or no ulceration of the intestines, that is, precisely those in which peritonitis would be a rare complication. Moreover, early in the war the chronic diseases of the liver spleen and kidneys referred to in the text were less frequent than they subsequently became; but be this as it may, the occurrence of the complication has been so thoroughly demonstrated by actual autopsies, as will hereafter be shown, that negative testimony to the contrary cannot be trusted.

calculated to impress the spectator who for the first time encountered these victims of war. My attention has frequently been directed to this group of cases by surgeons who had observed them, especially in armies operating in very malarial regions, as on the banks of the Mississippi and James rivers and in the lowlands of North and South Carolina and Louisiana.

*Pneumonia.*—Sudden and overwhelming congestion of the lungs, sometimes proving fatal in twenty-four hours or less, is one of the modes in which cases of chronic dysentery terminate. Intimately allied is the supervention of catarrhal or croupous pneumonia, or of pleuropneumonia involving one or both lungs. These accidents present no peculiarities which need discussion in this place. They constitute very frequent and fatal complications of the advanced stages of chronic dysentery. Indeed, it may be said that in the United States pneumonia is about as frequent in connection with dysentery as hepatic abscess is said to be in tropical climates. That some of these lung inflammations are of metastatic origin, and caused by the introduction into the circulation of emboli set free by the breaking up of thrombi in the veins leading from the ulcerated intestines, I do not doubt. Cases 139, 195, 247, 333, 393 and 787 were probably of this nature, as will be shown in a subsequent portion of this Section. The attention of those by whom most of our autopsies were made does not appear to have been directed to the possibility of this accident, which was doubtless of more frequent occurrence than is shown by the record. I cannot, however, believe that any very large proportion of the intercurrent pneumonias occurring in chronic dysentery owe their development to this process. Imperfectly as the lung lesions are described in most of the autopsies collected during the war, the frequency with which red or gray hepatization of whole lung lobes is distinctly affirmed is a noteworthy circumstance in this connection. Still more worthy of consideration is the fact, which will be shown when the autopsies of the chronic cases come to be discussed, that these deaths from pneumonia were most frequent during the inclement months; as if they were determined rather by the vicissitudes of the weather to which the sick in our tent and barrack hospitals were particularly exposed than by the course of the intestinal disease. This circumstance inclines me to the opinion that in the majority of cases the lung inflammation was due to the usual causes which at the same season produce pneumonia in healthy individuals, and that it was chiefly on account of the debilitating influence of chronic dysentery that its victims became more prone to this fatal chest disease.

*Chronic bronchitis and phthisis.*—Chronic bronchitis was another frequent complication of chronic dysentery, both in the Federal and Confederate armies.* Doubtless in very many of the cases in which this complication was observed the bronchial affection was dependent upon tubercular disease of the lungs. The exposure and fatigues of the military service in time of war, together with the impaired nutrition resulting from camp diet, undoubtedly favor the development of lung tuberculosis in predisposed subjects, and the depressing influences of chronic flux hasten the progress of the disease. Doubtless, also, in many even of those cases in which tubercular disease of the lungs is reported to have been observed in the autopsies, the lesion was actually some one of the chronic inflammatory processes we are recently learning to distinguish from tubercular disease, but which of course were confounded with it by those who made these dissections. The question of the

* PAUL F. EVE—*Answers to certain questions, &c., &c., relative to the health, &c., of the late Southern Army*, The Nashville Journal of Medicine and Surgery, Vol. I, N. S., 1866, p. 18—remarks: "One of the most frequent, distressing, obstinate and fatal affections treated in our hospitals was the combination of chronic diarrhœa with chronic bronchitis. A prescription benefiting one was almost sure to aggravate the other, and they were thus often antagonistic in treatment."

true nature of these lesions must be postponed to a subsequent chapter. Meanwhile, if by phthisis we designate all those chronic processes which result in destruction of lung tissue and cavity-formation, it must be admitted that this condition was an exceedingly common and fatal complication of chronic dysentery.

*Abscess of the liver.*—Deficient biliary secretion and other symptoms indicative of hepatic disorder are frequently observed during chronic dysentery, but suppurative inflammation of the liver was by no means a usual complication during the civil war, even in those forms of chronic flux in which the intestines were ulcerated. It will be shown hereafter that, including both the single and multiple forms, hepatic abscess was observed only in about one out of twenty-five dissections of such cases. It is doubtless true that in tropical climates inflammation, abscess and chronic diseases of the liver are the chief complications of the intestinal fluxes, but in the climate of the United States this part is taken by bronchitis, the various forms of pneumonia and lung phthisis. The frequency of these chest affections has not been sufficiently insisted upon by writers on the dysentery of temperate climates, but the comparative rarity of hepatic abscess in European dysentery has long been well known. The symptoms of this disease, when it occurs in the course of a chronic flux, are so similar to those which accompany it when developed during acute dysentery, that nothing need be added here to what has already been said on the subject.* Some additional considerations with regard to its frequency in this country and elsewhere will be presented hereafter when the autopsies are under discussion.

*Perineal abscess and fistula in ano.*—The occasional occurrence of perineal abscess in cases of acute dysentery has already been referred to,† and the same accident was probably still more frequent in the chronic cases, but statistical data bearing directly on the subject are wanting. Such abscesses were most likely to occur in tubercular subjects and those who had previously suffered from hæmorrhoids. They were prone to give rise to *fistula in ano;* a circumstance to which, in part at least, we may no doubt attribute the frequency with which the latter affection was observed among the troops. The statistical tables‡ of the First Medical Volume show that among the white troops 2,536 cases of fistula in ano were reported during the war, of whom 491 were discharged the service and 11 died. Among the colored troops the number of cases was 240, of whom 26 were discharged the service. How many of these cases would be traceable to acute or chronic dysentery if their true history could be known, and in how many other patients laboring under these fluxes the same complication occurred without being separately reported, can only be conjectured. It may here be added that patients who already labor under *hæmorrhoids* very often find them become painful and bleed more than usual while they are suffering from a chronic flux; and that sometimes, also, hæmorrhoids make their appearance in patients who had not previously suffered from them.§

*Ulceration of the cornea.*—This accident undoubtedly occurred much more frequently than is mentioned in the reports to the Surgeon General's Office. Only occasionally did it attract sufficient attention to receive mention; and in post mortem examinations it seems to have very often escaped notice because the eyes were not uniformly inspected. It was especially observed in cases which had advanced to extreme emaciation, and appeared during the last week or ten days of life. Dr. J. P. DeBruler reported,‖ August 30, 1862, that he

* Page 392, *supra.* † See p. 385, *supra.* ‡ Tables C, CI, CXI and CXII.

§ E. ANDREWS—*Chicago Medical Examiner*, Vol. III, 1862, p. 342—in a letter from the camp before Corinth, Miss., May 23, 1862, states that he observed hæmorrhoids in many of the cases of diarrhœa and dysentery among the troops at that point. ‖ *Supra*, p. 42.

had observed this lesion in some eighteen or twenty cases in hospital No. 2, Evansville, Indiana. He does not state the number of cases of chronic flux under observation, but the register and reports of the hospital show 226 admissions for diarrhœa and dysentery from February 22d, when it was organized, to the date of his report. The ulcer was always "in the centre of the lower part of the cornea," and usually affected both eyes. It appeared as a faint opacity which became gradually more dense, and in which an excavated ulcer with well defined edges presently appeared. Meanwhile the vascularity of the cornea was but slightly increased, in some instances not at all. The ulcer rapidly enlarged until it might hold a flax-seed or half a grain of wheat, then became stationary. In one instance both corneæ were perforated. All the cases but three had died at the date of the report. Two of these the reporter thought were improving, but they are referred to in no subsequent report, and it is most probable that they shared the fate of the rest.

In December, 1862, Prof. Alonzo Clark* made a communication to the Pathological Society of New York, in the course of which he stated that during the previous two months 72 soldiers suffering with "diarrhœa" had been admitted to Bellevue hospital from Fortress Monroe; of these 23 had died. "In 5 cases there was ulceration of the cornea of the left eye, all of which were known to be fatal except one, which was removed from the hospital by his friends, and has not been heard from." In reply to a question from Dr. Peaslee, Prof. Clark stated "that the ulceration of the cornea was in every case below the line of the pupil, and did not affect the sight; there was opacity and a little pouting out, and a considerable redness."

Dr. Elliott Coues† [now Assistant Surgeon, U. S. Army] observed several cases of the same lesion, which he described as "sloughing of the cornea," at Mount Pleasant hospital,

* A. Clark—*Diarrhœa*, Medical and Surgical Reporter, Vol. IX, 1862-3, p. 312.

† Elliott Coues—*Notes on Soldiers' Chronic Diarrhœa*, Med. and Surg. Reporter, Vol. X, 1863, p. 297. The cases referred to in the text were reported by Dr. J. P. Wyer: "Case I.—Moses Burge, company I, 49th Pennsylvania volunteers; admitted October 2, 1862; illness dated from August. Was for three weeks treated in a hospital tent; but by October 25, illness had become so severe that he was removed into a ward, to avoid all possibility of exposure to the vicissitudes of the weather, which so markedly affect patients suffering with this disease. From this period the evacuations decreased in number, averaging only three or four during the twenty-four hours; scanty in quantity; of a watery consistence; no blood; tongue dry, of a strawberry red; no sordes upon it or upon the gums. Slight tenderness of abdomen on pressure; emaciation extreme; great prostration; anorexia. Complains of great thirst. Pulse averages about 80, soft, readily compressible under the finger. November 20. An opaque spot observed on the right eye, near the juncture of the sclerotica and cornea; within, and at lower border of the latter. This white speck resembled much the ordinary deposit of lymph. It rapidly increased in size, extending in three days over more than half the cornea, and obscuring vision. As the opacity extended it seemed also to increase in density, the layers of the cornea apparently softening and undergoing disorganization. The vessels ramifying on the conjunctiva much enlarged, but there were no signs of active inflammation. Not the slightest pain accompanied the ulcerations. Two days after this appearance on the right eye, the left became similarly affected. November 25. Is gradually failing; pulse 75; one discharge; appetite better, but complains of great pain in stomach and bowels after eating. For the past day or two a slight purulent discharge has been noticed on right eye. Upon viewing the eye by a side view, the loss of tissue is very appreciable. The lower part of the cornea has sloughed away, so that the surface is not oval, but flat. Pulse in evening 65. November 26. Same general condition; only one passage. Both corneæ are sloughing rapidly. November 27. Pulse 75. Appetite failing; much nausea, but no emesis; sloughing of both corneæ progressing; sounds of heart normal, but feeble; no murmurs audible. November 29. Pulse 72. Complains of great distress after eating; is slightly delirious. An ulcer has formed over each malar bone. Tongue dry, red; skin dry, harsh. November 30. Pulse 85. No passage during the night. Anterior chamber of right eye filled with blood—the hæmorrhage from ulceration of the small vessels. December 1. Complains of pain and soreness of fauces on deglutition. The parts are turgid, tender, with a dusky erythematous suffusion. December 2. Pulse 82. Effused blood in the eye not absorbed. No evacuations, but constant and distressing desire to defecate. Tongue and fauces swollen and dry; thirst extreme. Right cornea appears almost or quite sloughed through. December 4. General condition same; failing fast. Complete anorexia. A rash like purpura has appeared on various parts of the body. This condition of things did not change much till December 6, when he died. Intellect good quite up to time of death, answered questions rationally; was quite blind after the first effusion of blood occurred. *Autopsy:* The large organs, the liver, spleen and kidneys of normal size, but considerably congested, especially the latter, in which the cortical and medullary portions cannot be distinguished. Stomach small, contracted. The valvulæ conniventes excessively thickened and in spots softened. No ulcers in any portion of intestines. Descending colon contracted and thickened; mesenteric glands enlarged and irritated. Half of the cornea of the right eye sloughed away, allowing the escape of the aqueous humor and collapse of the eye. Case II.—O. S. Sheppard, company A, 6th Vermont volunteers; attacked with diarrhœa August, 1862, since which time the disease has continued, producing excessive emaciation and debility. Appetite capricious; stomach irritable, rejecting the lightest food. Discharges average six or eight a day, of a watery consistence, passed with some pain. Desire to defecate urgent and frequent. Urine light-colored and abundant, but non-albuminous. Tongue usually dry, glossy, red. Complains of continual chilliness. Pulse weak and languid. December 24. For several days has been rapidly failing; appetite almost gone, and emesis is becoming a serious symptom. The stomach rejects even stimulants. Small abscesses have formed on the face and neck. There is an erythematous blush on the right elbow joint: and the same diffused congestion is perceptible on the fauces. These are tumid, and cause pain on deglutition. These latter symptoms are evidently of a scorbutic character, and are well pronounced. On the right cornea is an opaque, cloudy segment, beyond a doubt the beginning of sloughing of the layers. Cornea of left eye covered with small ulcers of the ordinary kind; only slight conjunctivitis, and *no* pain. Pulse not perceptible at the wrist. Passes urine and fæces involuntarily. Nothing is retained on the stomach. Death same day, and, unfortunately, no autopsy could be made."

Washington, D. C., during 1862. In his published account he criticised the word "pouting" employed by Prof. Clark, remarking that instead "a flatness and loss of tissue was readily perceptible by a side view of the eye." He states that "the ulceration always began at the lower part of the cornea, at the junction of it with the sclerotica." The paper is illustrated by two cases selected from the hospital case-book, which are so interesting that I have reproduced them in the foot note.

To the foregoing it may be added that Assistant Surgeon H. Allen, U. S. Army,* during 1863 and 1864 observed four cases of ulceration of the cornea in 41 autopsies of "chronic diarrhœa" made at Lincoln hospital, Washington, D. C. Also that in Section III of this chapter, in the record of the autopsy in case 720, the remark "eyes mortified," which probably refers to this condition, will be found, and in case 225 it is stated that "the corneæ of both eyes ulcerated about a week before death." These are the only special references to the occurrence of this accident during the civil war that I have been able to collect, but I do not doubt that it happened very frequently.

DeBruler† remarks, in the report from Evansville: "I think it will not do to say that the corneal ulceration depended merely upon the arrest of nutrition, for in many of our cases of typhoid fever this seemed quite as extreme as in the diarrhœa, without, however, leading to ulcers of the cornea." To this I may add that no cases of corneal ulcers occurring in the latter stages of fever were brought to the notice of the Surgeon General's Office during the war. Nevertheless such ulcers do occur, both in fever and in other severe diseases, although by no means so frequently as in chronic dysentery. Middlemore,‡ so far as I know, was the first to observe this accident in epidemic cholera. It occurred during the latter stages of the disease, "without having been preceded by any appreciable amount of inflammation." According to Thielmann,§ opacities of the cornea followed by ulcers, which sometimes perforate the cornea and evacuate the aqueous humor, occur during the advanced stages of scurvy; they are preceded by a scorbutic conjunctivitis. It has been stated by Arlt‖ that corneal ulcers, similar to those which occur in cholera, are seen sometimes in typhus, [our typhoid fever,] puerperal fever and other severe diseases. They occur in the lower segment of the cornea, and, if the patient recovers, heal, leaving an inconsiderable scar behind. They are preceded by considerable injection of the conjunctiva, especially over the lower half of the bulbus.

I have myself had no opportunities to examine any of the forms of corneal ulcers alluded to except those which occur in chronic dysentery. These, I doubt not, are similar

* H. ALLEN—*Synopsis of autopsies made at Lincoln General Hospital*, Amer. Jour. of the Med. Sciences, Vol. XLIX, 1865, p. 134. I note that this accident is not recorded in any of the cases in Dr. ALLEN'S case-book, (see note to p. 156, *supra.*) hence it does not appear in his autopsies reported in the last section. I do not, however, doubt the accuracy of his statement, which is evidently made from personal recollection.

† *Supra*, pp. 42 and 499.

‡ R. MIDDLEMORE—*On certain forms of disease of the eye, occurring in individuals who were suffering from or had recently been attacked by cholera*, London Med. Gazette, Vol. XII, 1833, p. 492. The cases were observed during the cholera of 1832 in the vicinity of Birmingham. They occurred for the most part "as the symptoms of the cholera were subsiding;" the diseases observed were amaurosis, suppuration of the eyeball, opacities of the cornea and ulceration and sloughing of the cornea. See, also, A. v. GRAEFE—*Ophthalmologische Beob. bei Cholera*, Archiv für Ophthalmologie XII, Abth. 2, 1866, S. 202.

§ H. THIELMANN—*Die scorbutische Augenentzündung*, Med. Zeitung Russlands, 1844, Nr. 1 u. 2. I have not been able to see the original, and cite from the abstract in Schmidt's Jahrbücher, Bd. 42, 1844, S. 332. The observations were made on patients from the Russian fleet treated in the naval hospital at Oranienbaum. THIELMANN described, 1, Blepharitis scorbutica; 2, Taraxis scorbutica; 3, Chemosis scorbutica; 4, Keratitis scorbutica; and 5, Iritis and Capsulitis scorbutica. Abstracts of this paper are also given by J. VAN ROOSBROEK—*Cours d'Ophthalmologie*, T. II, Ghent, 1853, p. 382, and R. KREBEL—*Der Scorbut*, Leipsic, 1866, S. 108 u. 183.

‖ F. ARLT—*Die Krankheiten der Binde- u. Hornhaut*, Vol. I, Prague, 1855, S. 215. He attributed the lesion to imperfect closure of the eyelids, which permitted the fluids secreted by the inflamed conjunctiva to dry on the cornea into a yellowish crust, beneath which the ulcers form. The statements of ARLT are substantiated by subsequent writers on the diseases of the eye, *e. g.*, STELLWAG VON CARION—*Diseases of the Eye*, Amer. Transl., New York, 1873, p. 77—who, in common with some other writers, explains such ulcers as of neuro-paralytic nature, and compares them to those which follow section of the fifth pair of nerves. Compare A. v. GRAEFE—*Hornhautgeschwüre bei infantiler Encephalitis*, Archiv für Ophthalmologie XII Abth. 2, 1866, S. 250.

in their nature to those observed by Magendie* in dogs confined to some single non-nitrogenous article of food. They are phenomena of slow starvation. I find no record of any case of dysentery in which this complication occurred during the civil war that terminated in recovery. But that this unfavorable result is not necessary was long ago pointed out by Finger,† who saw two patients recover from dysentery after the formation of ulcers in the cornea, which in one of them had perforated and determined prolapse of the iris.

Terminations and Sequelæ.—Chronic dysentery very frequently terminated fatally in consequence of an acute diphtheritic dysentery supervening, or the development of some intercurrent phlegmasia. *Sudden death* was a not unfrequent accident, and attracted considerable attention during the war. Patients who, though laboring under a chronic flux, were not supposed to be in any immediate danger, who were perhaps walking about the hospital wards, regarded by the attending medical officers as convalescents, occasionally fell to the ground and expired in a few minutes.‡ In such cases death sometimes took place by syncope, the debilitated heart simply ceasing to beat; in other cases subarachnoid serous effusion or pulmonary congestion was the immediate cause of the fatal issue; but in isolated instances it was produced by various other pathological conditions.§ Where the

* F. Magendie—*Mémoire sur les propriétés nutritives des substances qui ne contiennent pas d'azote*, Paris, 1816. He first observed this accident in a dog fed on white sugar and distilled water; both corneæ ulcerated during the third week of this diet. The ulcers perforated the cornea and evacuated the humors of the eye. Dryness of the eye did not precede the ulceration. The dog died extremely emaciated on the 32d day. In a second dog, fed in the same way, the corneæ began to ulcerate about the 25th day, and the dog died before the ulcers perforated. A third experiment gave similar results. Two dogs fed on olive oil only, died emaciated about the 36th day, but their corneæ were not ulcerated. Another dog was fed on butter only; he died emaciated on the 36th day. In this animal the right eye was ulcerated but not the left.

† Finger—*Die epidemische Ruhr*, Prager Vierteljahrschrift, Bd. IV, 1849, S. 145. These I understand to have been acute cases. Out of 231 fatal dysenteries he saw several other examples of cornea ulcers, chiefly in protracted cases, but does not state the precise number.

‡ O. B. Ormsby, Assistant Surgeon 18th Illinois volunteers, in a letter from the floating hospital Nashville, April 27, 1863—Chicago Medical Examiner, Vol. IV, 1863, p. 236—gives the details of two such cases: "Case I.—C. S., soldier, American, aged 25, was admitted to hospital, April 15th, as convalescent from diarrhœa: Tongue was clean; bowels regular; body emaciated; and the pulse regular, but weak. He had quinia et ferri citras, in small doses, simply as a desirable tonic to aid in building up his strength, and to eradicate any remains of malarious poison which might be lurking in his system. In the meantime he had permission to take exercise both on board and on shore. This course was pursued with apparent benefit until noon of the 17th. During the forenoon he had been quite active and cheerful; and when the dinner-bell rung, he remarked, that he would go and take his place at the first table. He started, and arrived at the head of the stairs, when he fell upon the floor. Word was brought me immediately, but when I reached him he was quite dead. At the autopsy, four hours after death, the rigor mortis was well-marked, the body not *extremely* emaciated, and suggillation, in dependent parts of the body, very distinct. The brain and spinal cord were exposed by the usual incisions, with no noteworthy circumstance attending, except, perhaps, that, upon division of the vertebral veins, fluid bleed, to the amount of two quarts, [?] was poured out. There was fluid contained within the membranes of the cord to the amount of, probably, f3iv. The dura mater was abnormally adherent to the skull at the base of the brain, and contained about f3ij of effused fluid. The base of the brain was thought to be slightly softened, but, in the absence of the microscope, it could not be with absolute certainty decided. The membranes and substances of both brain and cord were considerably congested, but the nervous matter of the cord appeared to have suffered no structural lesion. The lungs were healthy. Within the pericardium was found f3iv or v of serum. The muscular tissue of the heart was somewhat softened, and traces of congestion were observed. Stomach was simply congested,—liver healthy. The bowels, with the exception of the duodenum, showed evidence of nothing more than congestion of a passive character. The duodenum had, evidently, been the seat of both inflammation and ulceration; and, in several circular patches, the mucous and muscular coats were destroyed, leaving but the peritoneum. Perforation, however, had not occurred; and the ulcers seemed in process of cicatrization. The kidneys were much congested, but quite firm. This congestion appeared to have been quite recent, and to approach more nearly to an active arterial congestion than any thing discovered elsewhere. Case II.—E. D., Freedman, aged 25, had been admitted to hospital, April 17th, with chronic diarrhœa. He became convalescent under the use of the usual remedies; and upon the 27th was permitted to go on shore for exercise. He, however, took advantage of the opportunity to go to the sutler's store and obtain some nuts, Bologna sausages, &c., and also to strip off and bathe in the water of an adjacent bayou. During the afternoon of the 28th he was attacked suddenly with spasms, together with complete abolition of consciousness; dilated pupils; feeble and frequent pulse; and slightly stertorous breathing. Chloroform was administered with apparent benefit, and, upon the return of consciousness, also some carbonate of ammonia. He soon relapsed into another paroxysm, which was followed by a third, in which he died. Four hours after death, the body was examined. It was much emaciated,—the rigor mortis well-marked, and but little suggillation. Upon removal of the calvarium, several spots of effused lymph were discovered between the dura mater and parietal bones, together with considerable congestion of its surface. Beneath the dura mater was found two ounces of serous fluid. The brain, however, appeared to be only passively congested. The ventricles,—particularly the fourth,—were filled up with serum. The brain was unusually firm. The heart was found empty. Lungs, liver, stomach, and bowels all,—with the exception of some congestion,—healthy. Cases of a similar character to the above have repeatedly occurred here, commencing as early as the 1st of March. As I have noticed but little intermittent here, yet I am not of the opinion that they are the result directly of miasmatic influence, though they bear, apparently, some relation to the pernicious intermittent of this latitude. The patients almost universally present marked emaciation, with great tendency to œdema and anasarca; but, aside from the debility thus indicated, very frequently do not present marked symptoms of disease. One case was of a nurse who had not been taking medicine, and had been on duty regularly. In the evening, saying, he felt unwell, he went to his bed and lay down; and, at the end of four hours, when his watch came on, he was found quite dead, and had evidently been so from one to two hours." See also the account of a number of cases of sudden death by Medical Inspector Vollum, p. 96, *supra*.

§ There is, of course, no reason why cerebral thrombosis or cerebral hæmorrhage, the rupture of an aneurism or of an atheromatous artery in any part of the body, &c., should not occur in those suffering with chronic flux as well as in those whose bowels are healthy. Indeed, if the morbid process, which culminates in either of these accidents, has commenced, it will be readily understood that the mal-nutrition accompanying the bowel affection may be expected to hasten the *dénouement*. The question of clot formation in the cardiac cavities will be discussed hereafter.

patient escaped these accidents death took place ultimately from asthenia, preceded by extreme emaciation, unless a favorable change occurred. Recovery was most frequent among patients sent out of the region in which they were taken sick to hospitals in the northern states, and those discharged the service or permitted to return home on furlough. Under these circumstances convalescence sometimes set in after all hope had been abandoned. In any event it was usually slow; frequent relapses were prone to occur, sometimes even for years after, and disagreeable sequelæ often ensued.*

Almost every morbid process which occurs in such subjects has been regarded as a sequel of the former flux, especially if the patient is an applicant for pension. Various forms of tubercular disease, disorders of the nervous system,† rheumatism, heart disease, &c., have been attributed to this cause. It will readily be understood that the protracted disturbance of the nutritive functions which accompanies the chronic fluxes is favorable to the initiation of a great variety of morbid processes, and it must not be forgotten that in the case of convalescents it often happens that more or less debility of the digestive and assimilative processes continues long after the flux has ceased. Nevertheless it must be admitted that in many instances diseases occurring from other causes, in subjects who had long previously recovered from chronic dysentery, have been asserted, without sufficient evidence, to have been caused by the flux.

Certain morbid conditions may, however, justly be enumerated among the sequelæ of chronic dysentery. These are—prolapsus ani, which, if developed during the progress of the disease, occasionally persists; fistula in ano, the result of periproctitis terminating in perineal abscess; hæmorrhoids, which sometimes originate during dysentery in patients who had not previously suffered, and are then prone to continue;‡ and various disorders of the digestive organs. Among these digestive disturbances may be mentioned more or less pronounced dyspepsia; irritability of the bowels, which are often left so sensitive that the slightest irregularity in diet provokes diarrhœa; and sluggishness of the bowels manifested as frequent or even persistent constipation. The latter condition unquestionably very often results from impaired peristaltic action in the long diseased and greatly altered colon; the muscular coat is left in a condition of debility which, in extreme cases, borders on paralysis; the fæcal matters, no longer properly carried forward as in the healthy bowel, accumulate in the debilitated portion of the gut or above it, and alvine evacuations are rarely obtained except by medical assistance.§ Obstinate constipation, and even in some rare instances complete obstruction of the bowels, may result from two other lesions, which are much more difficult for the practitioner to deal with than the paralytic condition just

* According to the *Report of the Commissioner of Pensions for the year ended June* 30, 1871, Washington, Government Printing Office, 1871, p. 22, of 15,816 invalid pensioners at that time on the pay rolls whose disability was due to disease, 2,935 were suffering with "chronic diarrhœa." The table from which these figures are taken includes pensioners from former wars, as far back as 1812, but none whose disability was contracted later than the civil war; so that six years is the minimum duration which can be assigned to any of these cases.

† A curious affection, supposed to be a sequel of chronic diarrhœa, is reported by H. C. ROBBINS—*Case of Hemidiophoresis*, Boston Med. and Surg. Journ., Vol. I, N. S., 1868, p. 372—"J. W., aged 22, while in the army, six years ago, contracted chronic diarrhœa, which confined him to hospital for several weeks. Upon his recovery, he first noticed the phenomenon of profuse perspiration of the left side of his face, which condition still continues, nearly six years after it was first observed. His health is perfect in every other respect, and his mind is clear and strong, but every few minutes, winter or summer, he is obliged to wipe away the sweat from one side of his face. He is now a farmer, strong and energetic."

‡ See the remarks on these accidents as symptoms, p. 499, *supra*. I have no means of ascertaining the frequency with which they occurred after convalescence from the chronic dysentery of the civil war. It is, however, of some interest to note that the Commissioner of Pensions—*loc. cit., supra*—reports that six years after the close of the war there were still on the pension rolls of the United States 18 cases of prolapsus ani, 87 of fistula in ano and 108 of hæmorrhoids. This includes those surviving cases only in which the local trouble was sufficiently grave to be regarded a cause for pension, and in which no more serious pensionable disease existed. I have not the least doubt that in some of these cases the local trouble had its beginning in camp diarrhœa or dysentery, but it would be idle to conjecture in how many instances this was the case.

§ In extreme cases such fæcal accumulations may even result in obstruction of the bowels and symptoms of ileus. Such a case has been reported by LAUCERAUX—*Dyssenterie en* 1870.—*Obstruction stercorale à la partie inférieure du colon descendant.—Vomissements stercoraux.—Evacuation artificielle de l'estomac.—Douche ascendante. Guérison*, (Recueille par BARETTE,) Journ. de la Soc. de Méd. de Caen et du Calvados, An. I, 1876, p. 148. The patient was a man 40 years old, who had contracted dysentery while in captivity in Germany.

referred to. These are intestinal stricture, resulting from the contraction of the cicatrices of dysenteric ulcers, and constriction of the intestinal canal by peritoneal bands, adhesions, &c., formed externally to the bowel.

*Intestinal stricture or stenosis*, resulting from the contraction of dysenteric ulcers, is, I believe, much less frequent than might be supposed from the loose language of some of the text-books.* No case has been reported to the Surgeon General's Office either during the war or since; the Army Medical Museum does not possess a single specimen; nor have I found in the American medical journals any case substantiated by post mortem examination, in which this condition is reported to have followed a flux contracted during the civil war.† In view of the vast number of cases of diarrhœa and dysentery that occurred during the war these facts would seem to indicate that in America, at least, this accident is extremely infrequent. Yet I do not doubt that some few cases may have occurred and escaped report; for the coarctation does not generally become sufficiently

* *E. g.*, J. WARBURTON BEGBIE—*Dysentery*, in Reynolds' System of Medicine, Vol. III, London, 1871, p. 143. "On the other hand, in those instances of the disease which have been distinguished by an extensive loss of substance, the approach of the edges is impossible, and the deeper layers of the tissue which takes the place of the mucous membrane are frequently condensed into fibrous bands, which form projections into the intestinal cavity, interlaced with one another, and not unfrequently encroach upon the calibre of the intestine, in the form of valvular or annular folds, thus giving rise to a variety of stricture of the colon." So also S. O. HABERSHON—*Diseases of the Abdomen*, London, 1862, p. 385. "The contraction of the cicatrix sometimes produces considerable constriction of the intestine, and occasionally tends to fatal obstruction. Very frequently above the cicatrix all the coats become hypertrophied, showing that there has been much impediment." Similar passages might readily be multiplied: the use in them of the words "not unfrequently" and "frequently" leads to erroneous notions.

† I have made a very careful search, not only of journals but of transactions of state and other societies, with the result mentioned. Among other transactions, I examined particularly the four volumes of the *Proceedings of the Pathological Society of Philadelphia*, 1860-74, and the *Transactions of the New York Pathological Society*, Vol. II, New York, 1877, which contains reports of the cases and specimens of the diseases of the organs of digestion presented to that society from 1844 to 1876, but without finding a single case resulting from dysentery contracted during the civil war. For the advance sheets of the last-mentioned work, received while I was writing this note, I have to thank the courtesy of the editor, Dr. John C. Peters. I had at first supposed the case reported by Dr. H. B. SANDS to the New York Medical and Surgical Society—*Intestinal obstruction resulting from chronic dysentery, successfully relieved by Amussat's operation for artificial anus*, The New York Med. Journ., Vol. I, 1865, p. 55—to be an illustration of the condition under consideration, as the patient was reported to have been first admitted to the New York hospital in November, 1864, suffering with a chronic dysentery contracted in the army nine months previously. But in reply to a note of inquiry as to the ultimate fate of this man, Dr. SANDS has kindly sent me an account of the subsequent history of the case and of the autopsy, from which it appears that the patient died May 1, 1865, and that his disease was really tubercular peritonitis. The obstruction was due to peritoneal adhesions, and careful examination discovered "no evidence of past or present ulceration of the intestinal mucous membrane." Some account of this case will be found in the *Trans. of the New York Path. Soc.*, Vol. II, (cited *supra*,) p. 129. I note that this narrative contains no reference to the original incomplete publication, so that the connection of the two accounts might readily escape attention unless pointed out. Two other cases of stricture of the lower bowel, one of them, at least, consecutive to a chronic flux, with fermented stools, have recently been reported by Medical Inspector PHILIP S. WALES, U. S. Navy—*A new rectal dilator and explorer, with two cases illustrating their application*, The Medical Record, Vol. XII, 1877, p. 115—who cured both cases by dilatation effected with the aid of a hollow India-rubber instrument capable of distension with water injected by a syringe. In reply to a note of inquiry, Dr. WALES has politely informed me (July 31, 1877) that he has since encountered three additional cases, making five in all. In four of these cases the patients had previously suffered from "malarial fever and chronic diarrhœa," while in the fifth case the patient had had Panama fever. The great good fortune of Dr. WALES in the successful treatment of these cases excites doubts as to their actual nature. The literature of intestinal obstruction abundantly shows that the most accomplished surgeons have supposed stricture to exist when the obstruction was really due to peritoneal adhesions or other lesions exterior to the gut. The case of Dr. SANDS, referred to above, will serve as an illustration. Nor can we overlook the possibility that the obstruction in the cases encountered by Dr. WALES may have been of a purely functional character. The uniform success, so fortunately attained in all the cases, would naturally point to some such explanation. I suggest a comparison of these cases with that reported by MATT. BAILLIE—*Upon a case of stricture of the rectum produced by a spasmodic contraction of the internal and external sphincter of the anus*, Med. Trans. of the College of Physicians in London, Vol. V, 1815, p. 136. In this case all the symptoms of stricture were present, the feces were passed "nearly as thin as a ribbon," and yet, although the patient was so "averse to the introduction of a bougie" that "this instrument was never passed into the rectum," so that nothing was done "except keeping the bowels free from costiveness, and pursuing a very temperate mode of living," the disease gradually subsided, and seventeen years after its commencement it is reported that "hardly any inconvenience is felt." BAILLIE, as the title of the article cited shows, supposed the stricture in this case to be due to spasmodic contraction of the muscular coat of the bowel. A similar view was taken by THOMAS COPELAND—*Obs. on the principal diseases of the rectum and anus*, London, 3d Ed., 1824, p. 45, etc.—who has an interesting article (Sect. IV) "On the consequences produced by the irregular or too powerful action of the sphincter muscle." WILLIAM GAITSKELL—*Case of spasmodic contractions of the sphincter ani muscle*, The London Medical Repository, Vol. IV, 1815, p. 51—reported a case of the condition described by COPELAND, cured "by passing a large bougie up the rectum night and morning for a fortnight," and keeping the bowels open by castor oil with a few drops of laudanum. A. BOYER—*Remarques et obs. sur quelques maladies de l'anus*, Journ. Complémentaire du Dict. des Sci. Méd., T. II, Paris, 1818, p. 24—relates 14 cases of spasmodic stricture of the rectum, most of them associated with fissure. W. WHITE—*Further obs. on strictures of the rectum*, Bath, 1822—after citing the observations of BOYER, remarks (p. 32): "It does not, however, appear from the preceding observations of M. Boyer, that he had any idea of spasmodic constriction of the anus being connected with stricture higher up the rectum, or occurring as the consequence of it; but he seems to consider it as a primitive affection. Whereas, all the cases that have come under my notice, the complaint has always been attended by stricture some way higher up the rectum, except in one instance." That local spasmodic contractions of the muscular coat of any part of the intestinal canal might produce fatal obstruction was an old belief. SAUVAGES—*Nos. Meth.*, Amsterdam, 1768, T. II, p. 346—made this condition a species of ileus; I. spasmodicus. It would lead me too far to go into the literature of this doctrine. Suffice it to say that it has been controverted with much ability by J. ABERCROMBIE—*Diseases of the Stomach, &c.*, Edinburgh, 1828, p. 136, Path. of the intestinal canal, Part I, Sect 4—who concludes; "that, in a case of ileus, the distended part is the real seat of the disease; and that the contracted part is not contracted by spasm, but is merely collapsed, because it is empty, its muscular action being unimpaired."—*i. e.*, that the essence of the disease is local paralysis, not spasm. This view has also been adopted by ROKITANSKY—*Über Strikturen des Darmkanals und andere der Obstipation und dem Ileus zum Grunde liegende Krankheitszustände*, Oesterreich. Jahrb., Bd. XVIII, N. F., 1839, S. 13—"Ob krankhafte Zusammenziehung (krampfhafte Strictur) eines Darmstückes die

close to produce obstruction until a considerable period has elapsed after convalescence from the dysenteric attack, so that it is not surprising that the connection between the two should be overlooked, and the attention of the practitioner directed rather to the urgent symptoms resulting from the intestinal stenosis than to the remote disease which served as its starting point.

This circumstance, as well as the rarity of intestinal stricture after dysentery, will serve to explain why it so completely escaped the attention of the Greek, Roman and Arabian physicians. Even after the revival of medicine in Europe, and after dissection had again come to the assistance of clinical observation, dysentery does not appear to have been identified as the cause in any of the few instances of intestinal stricture observed, except in the case of a certain soldier related by Rhodius,* and a case cited in the work of Lieutaud,† which are the only examples of the condition under consideration that I have been able to find reported before the commencement of the present century.‡

In the early part of the present century we find the thickening, coaretation and irregular contraction of the ulcerated colon, so frequently observed in those dead of chronic dysentery, brought forward by several writers§ in explanation of the obstinate constipation

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Ursache einer andauernden Constipation und des Ileus werden könne, wird mit Recht von Abercrombie und allen besseren Pathologen bezweifelt," (s. 53.) A third view may be suggested: Local paralysis of the circular muscular coat may be the primary lesion, and yet in the parts immediately below the resulting dilatation the fibres of the circular coat may acquire preternatural energy, the accumulations in the distended part acting as a continual source of irritation. But whatever view be adopted, we must admit the existence of a group of cases in which the obstruction results from functional disturbance rather than from recognizable organic disease. J. S. BRISTOWE—*Obstruction of the bowels*, in Reynolds' Syst. of Med., Vol. III. Lond., 1871, p. 72—has emphasized the occurrence of these cases after dysentery, adopting the theory of spasm, and suggesting hypertrophy of the muscular coat to account for it; "not very infrequently spasmodic contraction, with great hypertrophy of the muscular tissue, is met with as one of the troublesome sequelæ of dysenteric ulceration of the rectum."

* I cite from BONETUS—*Sepulchretum*, Geneva, 1679, p. 882—"Militi cuidam dysenteria laboranti mutuo utriusque lateris ulcerati contactu intestina coaluere: venter suppressus tandem mortem accivit. I. Rhodius cent. 2. observat. 82." This case is also referred to by TH. BARTHOLINUS—*Hist. Anat. et Med. Rar.*, Cent. VI, Hist. 38. Copenhagen, 1661—"In dysenteria coaluisse intestina, et ex alvo suppressa subsequutam mortem vidit quoque Jo. Rhodius noster Cent. 2. Obs. 77. 82." I suppose the work of RHODIUS here referred to to be his *Observationum Medicinalium Centuriæ tres*, Padua, 1657, which I have not been able to see. ALEXANDER MONRO, JR.—*The Morbid Anat. of the Human Gullet, Stomach and Intestines*, Edinburgh, 1811, p. 155—refers to this case, giving the reference, "Vid. Rhodius, Mis. Cur. Obs. 508," which I confess is unintelligible to me. In a recent work, O. LEICHTENSTERN—*Verengerungen, Verschliessungen und Lageveränderungen des Darms*, Ziemssen's Handb., Bd. VII, 2. Leipsic, 1876, S. 515, Amer. transl., Vol. VII, New York, 1876, p. 628—cites the observation of RHODIUS from MONRO in a manner to give the erroneous impression that the latter had also made a similar observation: "Es werden sogar Fälle beschrieben, wo vollständige Verwachsung eingetreten sein soll (v. Monro, Morb. Anat. p. 155.—Rhodius, Mis. Cur. Obs. 508." I see no reason whatever to doubt the honesty of the observation of RHODIUS; simply we cannot at present accept his explanation of the mode in which the stricture observed arose.

† J. LIEUTAUD—*Hist. Anat.-Med.*, T. I, Paris, 1767, p. 118, Lib. I, Obs. 508: "Quidam post fluxum dysentericum, sævissimis cœli doloribus cum alvo planè sicca exerciabatur; quibus tandem occubuit. Inter sectionem cadaveris visenda se præbent intestina crassiora passim à veteribus excrementitionibus conglutinata. E. MISCELLAN. CURIOSIS." The value of the work of LIEUTAUD is greatly impaired by the circumstance that he does not give the details of any of his references. I have vainly searched the German Ephemerides in the hope of identifying this case and obtaining further particulars, and regret my want of success the more because the abstracts given by LIEUTAUD are not always wisely made.

‡ F. WANDESLEBEN—*Diss. de intest. recti strictura*, Halle, 1820, p. 3—cites a case from AMATUS LUSITANUS as one of obstruction after chronic dysentery, and refers to several cases of intestinal obstruction collected by SCHENCKIUS as occurring to patients suffering with the same disease: ("Homines tormentibus diu laborantes.") But I note that in the report of AMATUS LUSITANUS—*Cur. Med.*, Cent. II, Venice, 1557, p. 227, "Cur. XC. in qua agitur de quadam muliere per vulvam stercus emittente"—there is no mention of any intestinal obstruction. We are merely told that the patient had passed blood with her urine and fæces for four years, that at last the intestines being perforated stercus escaped per vulvam, and that the patient lived thus miserably for a long time. In the scholia it is stated that the disease was chronic dysentery, and an explanation of the bloody urine by conjecture is made that the ulcers had eroded the urinary passages also. As for the cases of intestinal obstruction cited from SCHENCKIUS—*Obs. Med. Rar.*, Frankfort, 1609, pp. 395, 425, 431 and 439—neither in that work nor in the originals from which the cases were borrowed does it appear that any of the patients had suffered from dysentery. These originals are: J. FERRANDUS—*De Nephritis et Lithiosis*, Ed. 2, Paris, 1601 f. 31; BENIVENIUS—Cap. 34, *op. cit.*, p. 435, *supra*; J. HOLLERIUS—*De Morb. Intern. Cur.*, Venice, 1572, fol. 114, Lib. I, Cap. 39, Scholia; and MARCELLUS DONATUS—*De Med. Hist. Mirab.*, Lib. V, Cap. 10, Mantua, 1586, fol. 211. In the case of HOLLERIUS, indeed, the patient suffered long with tenesmus, but this was after the stricture had formed and not because of it. Except the cases mentioned in the text, I do not find a single one which can be interpreted as following dysentery in the *Obs. Med. Rar.* of SCHENCKIUS, the *Sepulchretum* of BONETUS, the *De Sedibus et Causis Morb.* of MORGAGNI, or the *Hist. Anat.-Med.* of LIEUTAUD; nor do I find any unmistakable references to dysentery as a cause of intestinal obstructions in the dissertations of A. F. WALTHER—*De intest. angustia*, Leipsic, 1731, I cite from Haller's Disp. Anat. Select., T. I, Gottingen, 1750, p. 459; J. F. E. SCHNIZLER—*De ileo obstructione*, Erlangen, 1755, which contains an admirable copperplate with three figures representing obstructions from 1, peritoneal adhesions; 2 intussusception; and 3, stricture from scirrhus; P. HEVIN—*Rech. hist. sur la gastrotomie*, Mem. de l'Acad. Royale de Chir., T. IV. Paris, 1768, p. 201, and L. F. J. DUCHADOZ—*De Proctostenia*, Montpellier Thesis, 1771, in which 27 cases of stricture of the bowel, partly collected from literature, partly not before published, are given in detail. WALTHER, indeed, enumerates dysentery among the remote causes of intestinal obstruction, but he does so in a general way along with astringent medicines and foods, aromatics, abuse of alcoholic drinks, diarrhœa, worms, checked or excessive menstrual and hæmorrhoidal fluxes and the like, *op. cit.*, p. 464.

§ Thus, for example, METZLER—*Ueber die widernatürlichen Verengerungen des Mastdarms*, Hufeland's Journal, Bd. 33, St. 1, S. 28—affirms that in consequence of inflammation and ulceration of the mucous membrane of the colon and rectum intestinal strictures arise: "Gewöhnlich bei Entzündungen und Geschwüren der innern Häute, Muskeln, Drüsen, etc., des Colons, und Mastdarms die Wände derselben ernstlich aufgelockert, in Falten, Tuberkeln, Auswüchse, und, weiss Gott was für scirrhöse Wülste verändert werden, die die Hohlung verengern, den Durchgang der Excre-

sometimes observed after such fluxes. Among the most notable of those who advanced this view may be mentioned Annesley,* who asserted that in India strictures of various parts of the large intestine, especially the descending colon and sigmoid flexure, were of frequent occurrence after dysentery. But it is evident from the descriptions and colored plates with which he illustrated these opinions that Annesley had in view two conditions entirely distinct from the one under consideration, viz: the irregular coarctation of large areas of the colon with thickening of the intestinal walls, so common in chronic fluxes, and constrictions resulting from peritoneal inflammation. Nowhere does he mention the possibility of stricture resulting from the contractions of the cicatrices of the dysenteric ulcers; nor, indeed, do I find any evidence in his work that he had ever observed such cicatrices in any of his dissections.

The merit of having first presented a detailed anatomical account of the strictures which occasionally result from the cicatrization of dysenteric ulcers unquestionably belongs to Rokitansky.† He described two forms of this process: in the first, cicatrices, representing comparatively great losses of substance, contract into fibrous bands which form corded projections into the intestinal cavity, interlace with one another and ultimately encroach upon the calibre of the intestine in the shape of valvular or annular folds; in the second, occurring usually where the loss of substance has not been so great, the sinuous portions of mucous membrane at the edges of the ulcer, as well as the intact islets of mucous membrane which are sometimes scattered over the ulcerated surface, are puckered and compressed by the contraction of the cicatricial tissue into warty, pedunculated, polyp-like excrescences. According to the latest utterances of Rokitansky,‡ the first of these conditions

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mente zuerst erschweren, endlich unmöglich machen;" and he states further that this condition as it occurs after camp dysentery has been figured by MATT. BAILLIE—*Series of Engravings &c., to illustrate the Morbid Anatomy*, &c., Fasc. IV, Pl. III, Figs. 1, 2, 3, 2d Ed., London, 1812; but an examination of this plate shows that it represents merely the thickening, ulceration and coarctation of the bowel common in chronic dysentery, without evidences of any tendency whatever to stricture. G. A. RICHTER—*Die spec. Therapie*, Bd. II, Berlin, 1821, S. 117—in like manner speaks of induration of the intestine, "Verhärtung und Desorganisation des Darmkanales," as one of the sequelæ of dysentery, and adds that obstinate constipation which nothing can relieve is one of the consequences: "Die Folgen davon sind hartnäckige Verstopfungen, die keinem Mittel weichen, Knoten an dem After, blinde Hämorrhoiden, etc." WANDESLEBEN, [*op. cit.*, in last note,] whose dissertation is rich in references, cites the two foregoing passages in support of his statement that dysentery is one of the causes of stricture of the rectum, and adds as a third authority STOLL—*Rat. Med.*, T. III, Vienna, 1780, p. 292;—but this reference is even less fortunate than the others. The passage referred to simply mentions induration and rigidity of the intestinal coats as one of the consequences of chronic dysentery: "Cadavera horum phlogosin chronicam, et duritiem, rigiditatemque intestinorum potissimum crassorum monstrabant."

* JAMES ANNESLEY—*Diseases of India*, London, 1828, Vol. II, p. 348. "Constriction of a part or parts of the colon, most frequently of the left arch, descending colon, and sigmoid flexure, are amongst the most constant appearances observed upon examinations after death from the chronic forms of the disease now before us. These constrictions may be few or they may be many,—they are often of limited extent, resembling the ligature made by a cord, and frequently embrace a large portion of the bowel." To this passage the note, "See Plates 26, 36, and 37." Now the case which furnished the specimen represented in plate 26 was one of acute dysentery, (p. 98,) dead on the 20th day, in which the patient had general peritonitis, and the constrictions were conditioned partly by the lymph deposits, partly by irregular contractions of the muscular coat. That represented in plate 36 was from a case of acute dysentery, (p. 176,) dead on the 12th day of the disease. The mucous membrane of the colon was inflamed and ulcerated; the constrictions appear to have been due to irregular contractions of the muscular coat. The specimen represented in figs. 1 and 2, plate 37, was from a patient who had suffered from frequent attacks of dysentery, and who had "chronic diarrhœa" until his death. The constriction, which involved the descending colon and the rectum, appears to have been of the same character as that in the last mentioned case. Finally, the colon represented in the 3d figure, plate 37, was from a case of "chronic diarrhœa after acute dysentery," (p. 363.) There is no record of any constipation or obstruction of the bowels; the contractions in the colon were probably of the same nature as those in the last case, and the mucous membrane of the colon was "ulcerated" and "excoriated;" it is represented in plate 38. ANNESLEY speaks of these constrictions as strictures, and remarks: "A knowledge of the frequent occurrence of strictures in various parts of the colon, especially in its descending and sigmoid flexures, is of the utmost consequence in practice." He thinks that "stricture of the rectum is not so prevalent a complaint as is supposed by some," and that "the colon is much oftener affected than the rectum." I note, however, that in his account of the symptoms resulting from these strictures (p. 377) he nowhere mentions having observed complete obstruction of the bowels from this cause. Here, too, I may mention the narrowing of a portion of the intestinal canal which FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift, 1849, Bd. IV, S. 133—observed, in the Prague hospital, in two fatal cases of dysentery, involving in one instance the cæcum, in the other the sigmoid flexure. FINGER attributed it to the cicatrization of the dysenteric ulcers, yet admitted that he was not positive that the appearances supposed to be cicatrices were actually such, remarking: "deutliche Vernarbung und Verwachsung der Schleimhaut mit der unterliegenden Haut war jedoch nirgend zu beobachten."

† C. ROKITANSKY—*Ueber Strikturen des Darmkanals*, Oesterr. Jahrb., Bd. XVIII, 1839, S. 13; *Der dysent. Prozess*, Id., Bd. XX, 1839, S. 89; and the several editions of his *Lehrb. der Path. Anat.*

‡ In his original essay on the dysenteric process and in the first edition of his *Pathological Anatomy* [see transl. of Sydenham Society, Vol. II, London, 1849, p. 86] these processes are both described as occurring after dysentery, the second being said to occur also after catarrhal ulceration, [*op. cit.*, p. 65.] In the last edition of his *Lehrbuch*, Bd. III, Vienna, 1861, S. 203 u. 209, he adopts the view mentioned in the text, but adds that dysentery may leave behind it a chronic catarrh which may eventuate in cicatrices with coarctation (Verengerung) of the intestine quite like those which occur in other cases of catarrhal ulceration.

is characteristic of diphtheritic dysentery, the second of the ulceration which occurs in chronic catarrhal inflammation.

Just how many cases served as the basis for these descriptions the great pathologist has nowhere told us. So far as I know, he has only published the details of a single case,* which, it may be added, is one of particular interest as showing the great length of time that may elapse after dysenteric destruction of tissue before the resulting stricture produces a fatal result. In this instance the patient survived the dysenteric attack for about thirty years, during which he continually suffered from various abdominal troubles, chief among which was obstinate constipation, before the occlusion finally became so complete as to terminate in his death. But whatever the number of cases on which Rokitansky based his descriptions, comparison with the few that have since been published leaves no doubt that they are faithfully drawn from nature, and hence it is the less to be regretted that even to the present day they have been so generally borrowed by the text-books, some of the most pretentious of which find little of value to add to these graphic sketches.†

Nowhere have I found any attempt made to reunite the isolated cases of stricture of this kind which are scattered through modern literature. I have sought for information in the principal monographs and dissertations which either treat exclusively of strictures of the alimentary canal or some part of it, or deal with that subject as a branch of some more general theme, such as intestinal obstruction, diseases of the rectum and the like; but many, even of those which have appeared since the publication of the observations of Rokitansky, are quite silent on this head, and the majority of those who mention it at all deal with it in a cursory or superficial manner.‡ I have myself made an attempt to collect the individual cases of this kind scattered through medical literature, but have not been

* The case referred to will be found on p. 37 of the paper on intestinal stricture, cited in note †, p. 506. The patient was 60 years old, and had suffered from dysentery almost 30 years before while in the military service. The stricture, which was of the first kind described in the text, was situated at the commencement of the colon, not far from the ileo-cæcal valve. I note that in this paper ROKITANSKY expressly states that he had up to that time seen 32 cases of cancerous stricture of the intestine, but he mentions no figures in connection with the dysenteric strictures.

† In illustration, I may refer to the recent treatment of this subject by O. LEICHTENSTERN—*Verengerungen, Verschliessungen und Lageveränderungen des Darms*, Ziemssen's Handb., Bd. VII, 2, Leipsic, 1876, S. 515; Amer. transl., Vol. VII, New York, 1876, p. 628—who borrows pretty much his whole description from ROKITANSKY, though he only refers to him as authority for the statement that "the symptoms of constriction may first appear only many years—thirty years in a case of Rokitansky's—after the attack of dysentery, and then cause death by occlusion." This citation, however, is not very accurate, for, in the case referred to, I suppose the obstinate constipation which pursued the patient from the time he had dysentery till he died, and the other abdominal symptoms (Unterleibsbeschwerden) from which he never ceased to suffer, must be regarded as "symptoms of constriction." Nor is LEICHTENSTERN more fortunate in some of his few other citations. I have already commented on the mode in which he cited RHODIUS from MONRO, (see note * to p. 505, *supra*,) and shall have occasion to refer to his citation of MECKEL from MONRO a little further on, when his citation of HABERSHON will also be criticised. I will merely add here that his reference to a picture in ALBERS—*Atlas der path. Anat.*, Abth. IV, Bonn, 1862, Taf. XIII, Fig. 5–9—as an illustration of dysenteric stenosis is no more fortunate than the rest. ALBERS makes no mention that the man from whom the specimen was taken had ever suffered from dysentery, but simply says that he died of ileus: "Der Darm ist einem erwachsenen, an Ileus verstorbenen, gemüthskranken Manne entnommen." *Erläuterungen zu dem Atlasse der path. Anat.*, Abth. IV, 2, Bonn, 1862, Erklärung der Tafeln, S. 114.

‡ I will not attempt a complete list of works on the subject referred to in the text; but having examined a number of them with the result mentioned, I have thought that an enumeration of those consulted with this result would furnish a useful indication of the rarity of the condition under consideration. The following, published since the year 1800, but before the first publication of ROKITANSKY, are silent with regard to strictures of the intestine from the contraction of dysenteric cicatrices: C. G. LEHMANN—*Diss. de obstructione alvi*, Jena, 1820. T. COPELAND—*Diseases of the Rectum and Anus*, 3d Ed., London, 1824. G. CALVERT—*Diseases of the Rectum and Anus*, London, 1824. F. SALMON—*Stricture of the Rectum*, London, 1828. F. HOSPITAL—*Essai sur l'occlusion des intestins*, Paris Thesis, No. 165, 1830. N. D. BONNET—*De l'étranglement de l'intestin dans la cavité abdominale*, Paris Thesis, No. 246, 1830. The same may be said of the following, published since the appearance of the observations of ROKITANSKY: BENJ. PHILLIPS—*Obs. on intestinal obstructions depending on internal causes*, Med. Chir. Trans., Vol. XXXI, 1848, p. 1. S. FOSTER HAVEN—*Statistics of 258 cases of intestinal obstruction, with remarks*, The Amer. Jour. of the Med. Sciences, Vol. XXX, 1855, p. 351. WILLIAM BRINTON—*Intestinal obstruction*, London, 1867; a posthumous work. BRINTON analysed 600 necropsies of obstruction of the bowels; HAVEN, 258; PHILLIPS, 169, of which 136 had been previously published. None of these writers have taken the trouble to give references to the published cases used, hence their figures can neither be verified, nor can it be told how far one includes the cases of the others. They may have included cases of stricture after dysentery, but, from the mode in which their material is arranged, it is impossible to say. I may add to this list two valuable papers based on an examination of the necropsy records of two London hospitals, viz: C. H. FAGGE—*On intestinal obstruction*, Guy's Hospital Reports, Vol. XIV, 1869, p. 272, and W. W. WAGSTAFFE—*On intestinal obstructions*, St. Thomas's Hospital Reports, Vol. IV, 1873, p. 179. FAGGE'S paper contains the histories of 77 cases of intestinal obstruction, 22 of which were due to cancerous and other strictures, but none of them consecutive to dysentery. WAGSTAFFE'S paper contains abstracts of 18 cases of intestinal obstruction, 4 of them simple strictures, two of which, cases 5 and 16, are said to have been the result of "old cicatrices," but no mention of dysentery is made. The following contain more or less satisfactory allusions to the subject: CÆSAR H. HAWKINS—*Case of stricture of the colon with an analysis of 44 cases of artificial anus*, Med. Chir. Trans., Vol. XXXV, 1852, p. 85—mentions incidentally a case of supposed stricture following dysentery. *Vide infra*. GEORGE POLLOCK—*Intestinal obstructions*, Med. Chir. Review, Vol. XII, 1853, p. 315—mentions "contractions of cicatrices following ulcerations" as producing one form of non-cancerous stricture. This paper is interesting as containing abstracts of 32 cases of intestinal obstruction

very successful. The time at my disposal and my access to books have not been such that it has been possible for me to make an exhaustive research, nevertheless the laborious examination which I have actually made has covered ground enough to make the very barrenness of the results of value as showing the rarity of the conditions in question. The subject is one which might well be made the theme of a special investigation, and I trust the contribution here offered may serve to suggest such a work to some student possessed of the time and opportunity necessary to make it thorough.

I have found quite a number of cases, which I have not, however, attempted to collect, of non-cancerous stricture of the colon and rectum, in which the attention of the reporter appears to have been so engrossed by the stricture, and the surgical and other devices employed for its treatment, that no mention is made of the previous history of the case. In the records of the autopsies of such cases we are not unfrequently told that the stricture resulted from the contraction of a cicatrix, but there is nothing to show that the mucous membrane has been examined for other cicatrices, and no such description of the lesion is given as would serve to determine whether the ulcer which cicatrized resulted from dysentery or from some other form of disease, (*e. g.*, tubercular ulceration, etc.) Even in those cases in which there is a clear record of antecedent dysentery the report is often by no means as satisfactory as could be desired, and it is usually quite impossible to decide from it whether the cicatrices resulted from diphtheritic or catarrhal ulcers.

I find a small number of specimens of stricture following dysentery described in the printed catalogues of British pathological collections,* references to which I subjoin in the foot note, and a single American specimen in the catalogue of the pathological cabinet of the New York hospital.† I doubt not that a certain number of specimens exist also in the

from the Transactions of the Pathological Society of London, none of which appear to have been consecutive to dysentery. A. A. L. PERRET—*Essai sur les rétrécissements du rectum dus a l'inflammation*, Paris Thesis, No. 325, 1855, p. 33. R QUAIN—*The Diseases of the Rectum*, 2d Ed., London, 1855—in his section on stricture, has an interesting account of "the cases in which the narrowing of the bowel results from the cicatrization of an ulcer," p. 184 *et seq.*, and gives one case (not fatal) in which dysentery was the cause, (p. 193.) A. P. DUCHAUSSOY—*Anat. path. des étranglements internes*, Mém. de l'Acad. Imp. de Méd., T. XXIV, Paris, 1860, p. 97—an elaborate work, to which a copious bibliography is appended, and in which "rétrécissements cicatriciels et rétrécissements inflammatoires," including syphilitic strictures, are treated under a single head, (p. 204.) T. J. ASHTON—*Diseases, Injuries and Malformations of the Rectum and Anus*, 3d Ed., London, 1860, p. 304—says: "Dysentery and diarrhœa, particularly when neglected or improperly treated, will lead to the formation of stricture, and it may also result from the cicatrization of ulcers attending the former disease. Since the last edition of this work I have had two medical men under my care, with stricture resulting from dysentery. One was an army surgeon, who suffered severely while with the army in the Crimea; the other came from the West Indies, where he had long resided." No further particulars of these cases are given. T. B. CURLING—*Obs. on the Diseases of the Rectum*, 3d Ed., London, 1863, p. 119—relates a case of stricture of the rectum following chronic dysentery, and remarks: "Though contractions in different parts of the large intestines have been noticed by pathologists who have investigated chronic dysentery in warm climates, this disease is by no means a common cause of stricture of the rectum." P. GRUENDLER—*Diss. de enterostenosi*, Berlin, 1864—enumerates among the causes, p. 6, "2, aut cicatrices in tela mucosa et submucosa ex ulceribus, imprimis ex ulceribus dysentericis ortæ, quæ quidem Frerichs sæpius apud nautas multum in maribus ad meridiem spectantibus versatos observavit." I do not know that FRERICHS ever published any such statement, which I suppose to be the mere hearsay of the lecture-room. R. BURKART—*Diss. über Mastdarmstenosen*, Bonn, 1869—says, speaking of cicatrix strictures, (Narbenstriktur.) that all catarrhal and diphtheritic conditions of the mucous membrane (as in cholera and dysentery) may give rise to stricture, and that the cicatrix arising from the healing of the diphtheritic ulcer is especially characterized by its tendency to retraction. W. H. VAN BUREN—*Diseases of the Rectum*, New York, 1870—like CURLING, emphasizes the comparative rarity of rectal stricture after dysentery, (p. 106.) See also J. SCHÜTZ—*Med. Casuistik*, Prague, 1872, S. 140—Impermeabilität des Darms durch Darmstenose; and ANDR. VON HÜTTENBRENNER—*Die Darmstenosen im Kindesalter*, Jahrb. für Kinderheilkunde, Bd. IX, 1875-6, S. 25—who remarks on the rarity of stricture after dysentery in children, and thinks narrowing of comparatively long portions of the colon from the cicatrization of numerous follicular ulcers more frequent.

* *Catalogue of the Anat. Museum of the Univ. of Edinburgh*, 1831, I, 63, p. 66. *Catalogue of the Museum of the Army Med. Dept., Fort Pitt, Chatham*, London, 1833, Div. IV, No 84, p. 102. *Catalogue of Anat. Preparations in the Hunterian Museum, Univ. of Glasgow*, 1840; great intestines R., Nos. 43, 44 and 45, (from one case,) p. 73. *Descriptive Catalogue of the Anat. Museum of St. Bartholomew's Hospital*, Vol. III, London, 1862, Part I, Series 16, No. 116, p. 110, and No. 126, p. 112. *Appendix to the Path. Catalogue of the Museum of Guy's Hospital*, London, 1863, p. 55, No. 1884[35], is most probably from a case of chronic dysentery; the record is, "Inflammatory stricture and ulceration of the rectum undergoing cicatrization. W. R., aged 37, entered the hospital in a dying state; his disease was found to be phlebitic abscess of the liver, dependent upon an ulcerated condition of the intestine." *Catalogue of the Path. Museum of St. George's Hospital*, London, 1866, Series IX, No 159, p. 441. There are besides a rather larger number of cases in these catalogues in which the stricture is said to have followed ulceration, or to have resulted from a cicatrix, but with nothing to show whether the ulceration was caused by dysentery.

† The only American specimen of which I have found notice in any printed catalogue is in the *Catalogue of the Pathological Cabinet of the New York Hospital*, New York, 1860. Digestive system, No. 467, p. 205. "Stricture of the rectum, following tropical dysentery. * * * The constriction commences about an inch above the anus, and is also an inch in length. * * * Immediately surrounding the stricture, and extending for some distance above and below it, there exists a great thickening of the tissues, so that the walls of the gut are nearly an inch in thickness. In the constricted portion, which would admit a No. XII catheter, and also a short distance above it, are seen several ragged superficial ulcers of the mucous membrane." No microscopical examination of the thickened tissue was made.

great modern pathological collections on the continent of Europe, but know of no printed catalogues of these treasures. I have also found reports of a few cases in which various modes of treatment are alleged to have been successfully employed, or in which, the reporter having lost sight of the patient, the termination of the case is unknown, as well as a few in which death resulted and a more or less satisfactory account of the autopsy is given. References to these cases are subjoined in a foot note.*

It seems reasonable enough to suppose that dysenteric cicatrices might serve, as other cicatrices sometimes do, as the point of departure for subsequent carcinomatous development, but I have been unable to find an unmistakable case of this pathological sequence. In the few that might at first be supposed to bear this interpretation, an examination of the record makes it more probable that cancer was the primary disease, and that the dysenteric symptoms resulted from the irritation set up by the morbid growth.†

* Here I may mention the case, reported by HAWKINS, [p. 111, *op. cit., supra*, p. 507,] "of a gentleman, 76 years of age, who had suffered from dysentery in a tropical climate, which had probably produced contraction of the colon below the liver." The patient died, but there was no autopsy. G. M. HUMPHRY—*Three cases of stricture of the rectum treated by incision*, Association Medical Journal, Jan., 1856, p. 21. Case I followed dysentery; the patient was lost sight of, and its termination is unknown. The same is true of a case of OPPOLZER'S, reported by B. LONDON—*Dysenteria cum strictura ani*, Oesterreich. Zeitschr. für Prakt. Heilk., IX Jahrg., 1863, S. 794. Here belong also the two cases reported by ASHTON [*loc. cit., supra*, p. 508,] the results of which are not stated. In the following cases cures are said to have been effected, or great amelioration in the symptoms produced: GEORGE BUSHE—*Treatise on the Malformations, Injuries, and Diseases of the Rectum and Anus*, New York, 1837, p. 240—mentions the case of a lady who, six years before, "had an attack of dysentery, in consequence of which, lymph was effused on the mucous membrane within the internal sphincter, and gave rise to such adhesions, that when I first examined her. I could not introduce my little finger. However, by the use of the bougie, and castor oil, I am happy to say, that the orifice is now nearly of its proper size." RICHARD QUAIN—*The Diseases of the Rectum*, 2d Ed., London, 1855, p. 193—a case of rectal stricture said to have followed chronic dysentery of two or three years' duration treated by solid and membranous bougies. The latter is described (p. 217) as "a membranous tube for fluid pressure," which "may be distended with air or water." The patient was discharged greatly benefited. JOLLIFFE TUFNELL—*Practical remarks upon stricture of the rectum*, &c., Dublin Quart. Jour. of Med. Sci., Vol. XXX, 1860, p. 53—reports a case following dysentery said to have been cured by the use of a special form of tubular bougie. HORACE NELSON—*Stricture of the rectum*, &c., The British American Journal, Vol. II, 1861, p. 302—reports the case, observed at Plattsburg barracks in 1850, of a soldier of the 4th U. S. infantry, whose stricture was the sequel of chronic dysentery contracted during the Mexican war. A cure is said to have been promptly effected by division by the knife. JOHN SCOTT—*Two cases of severe stricture of the rectum*, California Medical Gazette, July, 1869, p. 229—reports two cases, said to have followed dysentery, treated successfully by forced dilatation. WILLIAM ALLINGHAM—*Diseases of the rectum*, 2d Ed., London, 1873, p. 131—reports a case of stricture of the rectum in a patient who had "suffered from both diarrhœa and dysentery," said to have been cured by bougies. Here belong also the cases of Med. Inspector PHILIP S. WALES, U. S. Navy, cited above, [note to p. 504.] In the following fatal cases the correctness of the diagnosis was established by post mortem examination: ROKITANSKY—Case cited in note * to p. 507, *supra*. BAUDENS—*Leçon sur l'anus artificiel*, [Hôpital Militaire du Gros-Caillou,] Gaz. des. Hôpitaux, Vol. IV, 1842, p. 227—relates a case in which stricture of the rectum followed chronic diarrhœa (dysentery?) in a soldier. The *Trans. of the New York Path. Society*, Vol. II. New York, 1877, contains reports of two cases of stricture of the rectum consecutive to dysentery, viz: "Case 13, by Dr. T. M. MARKOE, 1850," p. 163, and "Case 17, by Dr. L. A. SAYRE, 1852," p. 164, of which further particulars will be found in the New York Med. Times, Vol. II, 1853, p. 175; this patient, a man, had also suffered from syphilis, which complicates the question of etiology. T. B. CURLING—*Obs. on the Diseases of the Rectum*, 3d Ed., London, 1863, p. 119—relates a case of "ulceration of the rectum from chronic dysentery, terminating in a double stricture of the gut." The patient was a sailor, age 31. J. C. MESSER—*Organic stricture of the rectum*, Trans. of the Path. Society of London, Vol. XI, 1859-60, p. 111—reports a case of stricture of the rectum following dysentery, in which the immediate cause of death was ulceration and perforation of the cæcum. The patient was a man, age 79. S. O. HABERSHON—*Dis. of the Abdomen*, 2d Ed., London, 1872, p. 412—relates two cases. In the first, case 172, the patient, a sailor, age 33, after recovering from dysentery, was accidentally killed. At the commencement of the rectum the calibre of the bowel was found greatly diminished by the contraction of cicatrices. It is not stated whether any inconvenience had been experienced from this condition. In the second, case 173, the patient, a young gentleman "who had had syphilis many times," after recovering from dysentery was troubled by habitual constipation, and a stricture could be felt at no great distance from the anus. It was treated by dilatation with temporary benefit, but subsequently an abscess formed in the left iliac region, fistulæ resulted, and the patient died. "Numerous traces of old ulceration" were found in the sigmoid flexure, and much contraction of the intestine had been produced by the cicatrization. Above the contracted parts ulceration had set in, and the intestine had been perforated at three or four points. This had given rise to the abscess-formation, but "fæces do not appear to have been discharged" through the fistulæ. H. M. MADGE—*Case of intestinal obstruction*, &c., The Lancet, Vol. II, 1869, p. 80—reports a case of stricture at the upper part of the sigmoid flexure consecutive to diarrhœa (dysentery?) in a woman; post mortem examination showed that it was "due to the cicatrization of a former ulcer." C. E. A. PINGUET—*Des Rétrécissements du rectum*, Paris Thesis, No. 17, 1873, p. 29—reports a case of stricture of the rectum in a woman, aged 28, who had dysentery 12 years and ribbon-like stools for 7 or 8 years. CASTEX—*Rétrécissement dysentérique du rectum*, Bull. de la Soc. Anat. de Paris, An. LI, 1876, p. 684—reports a case of rectal stricture in a woman, aged 34, who suffered from chronic dysentery of a year's duration.

† Thus Dr. BENJ. MCCREADY, in 1857, exhibited to the New York Path. Soc.—Trans., Vol. II, 1877, p. 151—a specimen of cancer of the rectum in a woman, aged 71, who "had signs of chronic dysentery for two years," without impaired general health, which appear to have been due to cancer of the rectum. Eighteen months before her death "emaciation, debility, and sallowness set in," followed by the passage of fæces and flatus from the vagina. On the autopsy the rectum was found to terminate "in a kind of cloaca, including the upper part of the vagina, with thickened walls," and there were numerous secondary cancer nodules in the liver. This case recalls that long ago reported by AMATUS LUSITANUS, see note ‡ to p. 505, *supra*. I may refer in this connection to a case reported by S. O. HABERSHON—p. 518, *op. cit., supra*—to whom it was communicated by WILKS, of a man, 72 years old in whom death occurred from a stricture of the transverse colon due to a morbid growth "approaching in character the so-called villous cancer." He comments on this case as follows: "Simple acute disease of a dysenteric character took place in this patient, ulceration followed, and, at the seat of one of these ulcers a villous growth was developed, which led subsequently to constriction," (p. 519;) and again: "The first symptoms were those of dysentery, as shown by the diarrhœa and the discharge of mucus," (p. 521.) Now I note in this case 1st, that the "first symptoms" referred to took place August 11, 1855, and the man died August 29th. The microscopical characters of the tumor are pretty well described, and correspond with what we know of cylindrical epithelioma, which is prone to luxuriate superficially into papillary (villous) forms. Is it at all probable that, as HABERSHON assumes, dysentery should give rise to ulceration, ulceration to cicatrization, and that such a growth as is described should be subsequently developed, all in the brief period of 18 days? Is it not much more likely that the villous growth was an old affair, and that the so-called dysenteric symptoms resulted from it? I point out that in the preliminary history we are told that during the few years preceding this last illness the patient had "suffered at frequent intervals

*Peritoneal bands and adhesions*, the result of local or general peritonitis, occurring during the progress of either acute or chronic dysentery, may also give rise to subsequent obstruction of the bowels. This may happen in several ways: Plastic lymph, effused during peritonitis, may subsequently contract and produce coarctation of the intestinal canal at one or more points;* or adhesions between adjacent knuckles of the intestines may give rise to obstruction, especially if the adhesion is between displaced portions of the colon;† or peritoneal adhesions may take the form of bands by means of which knuckles of intestine may be incarcerated. An interesting case of the latter accident is reported in the treatise of Savignac.‡ Intestinal obstructions produced in these ways are probably even more frequent than strictures from the contraction of ulcers,§ but the possible connection of dysentery with the etiology does not appear to have received the attention it deserves; and indeed the nature of the accident is often first recognized on dissection, when it is not always possible to obtain a complete antecedent history.‖

POST MORTEM APPEARANCES IN CHRONIC DYSENTERY.—The lesions recognizable in the intestinal canal of those dead from chronic fluxes may be referred to three groups, which may exist either singly or variously combined. These are: 1, Chronic inflammation of the mucous and submucous coats of the intestines, especially of the large intestine, without ulceration. 2, Chronic inflammation accompanied by follicular or other ulcers, especially in the large intestine; in these cases the pathological picture is often complicated by the development, just before the fatal issue, of diphtheritic inflammation between the ulcers. 3, Extensive ulceration of the large intestine, the result of sloughing during a previous attack of acute diphtheritic dysentery. The first and third of these conditions have been

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from diarrhœa, with colicky pains in the abdomen, and often from painful defecation. His bowels were at times so irritable that, after swallowing only a cup of tea, it seemed at once to pass through them, almost before he could reach the closet; these symptoms became increasingly severe." Here is unmistakable evidence of an old intestinal trouble. LEICHTENSTERN *(loc. cit.*, note †, p. 507, *supra)* cites this case as an example of the error of mistaking the polyp-like puckering of the mucous membrane around the edges of certain dysenteric cicatrices (see p. 506, *supra)* for cancer, which he says was frequent in the older literature: "In der älteren Literatur häufig als Skirrhus beschrieben. Meckel, Entr. Comment. Leipz. T. XV.—Monro, l. c., p. 155. Vergl. Habershon, l. c., p. 385." In the passage here cited HABERSHON refers to the case discussed above in the following words: "Dr. Wilks has informed me of a case in which the cicatrix presented a growth at its margin, evidently of a carcinomatous character, indicating a greater tendency to heterologous deposit in the new tissue." Now clearly LEICHTENSTERN has cited this passage without seeing the history of the case referred to in it; nor are his two other citations more fortunate. MONRO, in the passage cited, expresses no personal opinion, but simply cites MECKEL: "Scirrhous Tumours have been described by MECKEL, as being sometimes found within the Colon in cases of Dysentery†." To which the note: "† Vid. Meckel, extra Comment. Leipsick, Tom. XV." The reference to MECKEL is misprinted by LEICHTENSTERN, and he does not appear to have verified it; had he done so he would probably have modified it, for I have searched Vol. XV of the Leipsic Commentaries (Commentarii de Rebus in Scientia Naturali et Medicina Gestis, T. XV, Leipsic, 1768-70) in vain for the statement referred to.

* An illustrative case will be found in the *Transactions of the New York Pathological Society*, Vol. II, New York, 1877, p. 148, case 1. The case was reported to the society by Dr. ERSKINE MASON, Jan. 28, 1874; see also The Medical Record, Vol. IX, 1874, p. 209. The patient, a man 76 years old, had two and a half years before suffered from a severe attack of dysentery. Six months after he recovered he was seized with violent pain in the bowels, which recurred at intervals. Ultimately, symptoms of rectal stricture were developed, and lumbar colotomy was performed with temporary relief. Subsequently, however, the symptoms indicated the existence of another stricture higher up, and the patient died. On the autopsy three strictures were found,—one near the caput coli, one in the transverse colon, and one less marked in the rectum, all due to peritoneal adhesions on the exterior of the bowel.

† A case illustrating this accident has been reported by SHAW—*Intestinal obstruction; operation for artificial anus*, Trans. of the Path. Soc. of London, Vol. IV, 1852-3, p. 147. The ascending colon was found in dissection to form a loop upon itself, and "the two portions lying parallel were firmly united by lymph to each other and to the adjacent parts." The patient was a laboring man, 63 years old, and the previous history is incomplete, but as we are told that the mucous membrane of the colon presented "many cicatrized ulcers," there is no reasonable doubt that the condition found had its origin in a previous dysentery. It is expressly stated that "no actual stricture was found in the colon."

‡ J. DELIOUX DE SAVIGNAC—*Traité de la Dysentérie*, Paris, 1863, p. 207, Obs. 2. Case of a naval officer who six years before had suffered from dysentery, in the Black Sea, and who died with symptoms of obstruction of the bowels. On the autopsy it was found that two knuckles of small intestine had been strangulated in a curious ring formed by an intestinal diverticulum 8 to 10 centimetres long, which had become bent upon itself, forming the posterior part of the ring, while its anterior portion was formed by a fibrous band, the result of an old peritonitis, which bound the extremity of the diverticulum to the mesentery. The author remarks: "La bride péritonéale qui complétait cet anneau s'était développée à proximité d'une coarctation intestinale due vraisemblablement à la cicatrisation d'anciens ulcères dysentériques. Il est probable aussi que, au voisinage des ulcérations intestinales, une péritonite locale et par propagation se sera déclarée, laquelle à son tour aura favorisé la formation de la bride, et ultérieurement son adhérence au mésentere."

§ On the frequency of obstructions from these bands and adhesions the reader may consult the essays of PHILLIPS, POLLOCK, HAVEN, DUCHAUSSOY and BRINTON, cited in note ‡ to p. 507, *supra*.

‖ Nos. 1247 and 1248, Med. Section, Army Med. Museum, illustrate this remark. The first exhibits obstruction of the ileum by peritoneal bands and adhesions; the second is a portion of the ileum, dilated, ulcerated and perforated, from just above the obstruction. The patient, a man 29 years old, had suffered at intervals for a year with symptoms of obstruction of the bowels. No anterior history could be obtained.

already so fully described as to require but brief mention in this place; the second will demand a more detailed account.*

*Chronic inflammation of the mucous and submucous coats of the intestines without ulceration.*—This process has been sufficiently described under the heading of inflammation of the intestinal mucous membrane without ulceration, in a previous portion of this section.† The points then dwelt upon may be briefly recapitulated, as follows: In these chronic cases the bright-red discolorations of acute inflammation are replaced by mahogany-red, brown, green, slate-color, ash-color, or other neutral tints of various hues; black, bluish, or brownish deposits of pigment are observed in the closed follicles, or in patches scattered over the mucous membrane of both large and small intestines, and in the apices of the villi of the latter, especially of the ileum. With these modifications of color, enlargement of the solitary follicles, and more or less thickening of the mucous membrane and submucous connective tissue, especially of the large intestine, are associated. The degree of this thickening varies with both the duration and severity of the case. In its appearance

* After Section II of this chapter was stereotyped I received an interesting letter from Dr. A. E. CAROTHERS, formerly Assistant Surgeon, U. S Volunteers, giving an account of his observations in "a somewhat large number of autopsies" in cases of chronic diarrhœa during the civil war. Had I received this communication in time, I would have printed it in Section II. As it is, I have thought it of sufficient interest to present to the reader in this place. It may be compared with the reports of cases 842 to 851 in Section III, (p. 252–3, *supra*,) which are accounts of autopsies from the case-book of the Natchez hospital while Dr. CAROTHERS was in charge. It will be evident to the intelligent reader that the three classes of lesions enumerated in the text fell under the writer's observation, and that his description includes phenomena belonging to acute cases. "During my service with the Army of the Potomac and in the 'Defences of Washington,' nearly all of the cases I examined showed a diffuse inflammation of the colon, especially in its lower part, accompanied by thickening of the submucous cellular tissue and softening of the entire mucous membrane to such an extent as to admit of its being easily scraped off with the finger-nail. The solitary glands of the small intestine were seldom affected, the agminated glands frequently but not constantly inflamed, and even ulcerated. The glands of the colon were not affected sufficiently to attract any special attention; in fact, the seat of the disease seemed to be in the whole thickness of the mucous membrane and subjacent tissues, and not in the glandular structures, they being affected only secondarily, if at all. When I was ordered from Alexandria, Virginia, to Brownsville, Texas, in the spring of 1864, I was struck with the great difference of the autopsic phenomena presented by apparently the same disease. I found in nearly every case the condition described by TRIPLER in the Mexican war, viz, circumscribed excavated ulcers with well-defined edges, appearing as though cut out of the whole thickness of the mucous membrane with a punch. They had a dark ash-colored base, were most frequent in the upper portion of the colon, and as you passed downward were found to extend their area, retaining their well-defined margin, until by their coalescence they involved the whole calibre of the intestine in one large ulcer of the same character, accompanied with an enormous thickening of the walls of the gut, caused by deposits of lymph in the areolar tissue. In many of the older cases more or less complete cicatrization had taken place, especially in the lower part of the colon and rectum, and, by the contraction of the inodular tissue, had lessened the calibre of the bowel greatly. I have seen it but little larger than a goose-quill in some cases. In others, however, instead of pursuing this slow course, the ulcerative action became intensified at points, and penetrated to the peritoneal covering, which contracted inflammatory adhesions to whatever part it happened to be in contact with. Perforation sometimes ensued, when, if from an accident the adhesions gave way, extravasation and peritonitis caused rapid death. In one case I found four such perforations in the transverse colon, caused by adhesions to the omentum, and in another the ulcer had, in the sigmoid flexure, perforated both peritoneal surfaces, and penetrated over an inch into the subjacent muscle. But the chief point of interest lay in the cæcal portion, where the traces of disease seemed more recent. Here its primary seat seemed to be in the follicles, in which it could be traced with the naked eye through all stages from the small black point indicating the orifice, looking much like the black specks on the face in a case of acne, through congestion and inflammation, to ulceration commencing at the orifice of the follicle and ultimately destroying the entire gland, leaving in its place the excavated ulcers above described. * * * There was comparatively little disease in the small intestine, the glands of Peyer being inflamed sometimes, but seldom ulcerated. In fact, the healthy condition of the upper bowel was a subject of remark, when compared with the extensive disease of the colon. It is proper to remark in this connection that the troops among whom these cases occurred were almost universally affected with scurvy, and also that they had been serving at Vicksburg and Morganza, notably malarious places, before going to the Rio Grande. How far this condition of the glands of the large intestine may have been due to an attempt to eliminate one or the other of these poisons, is, in the present state of our knowledge of the physiology of the glands of the alimentary canal, difficult to determine; but I am inclined to the opinion that there is some connection between them, in view of the excretory function of the lower intestine, as contrasted with the absorbent action of the upper. In the fall of 1864 I took charge of the general hospitals at Natchez, Mississippi, where I found many of the class of cases just described, especially among soldiers who had served in Louisiana and Texas, but I also found a new class of morbid appearances, that of an erythematous inflammation of the mucous membrane, in which the primary lesion appeared as a bright rose-colored or red line surrounding a patch of the mucous membrane, from which the epithelium had entirely degenerated, and which appeared to have spread from a central point, like erythema-centrifugum or lichen circumscriptus, destroying the epithelium in its course. This denuded surface took on ulcerative action, attended with thickening of the coats of the bowel, coalescence of the patches, destruction of the mucous membrane, cicatrization, contraction, &c. These appearances existed mainly in the colon, and, if I remember aright, were accompanied with a species of exudation of pseudomembrane about the ileo-cæcal valve, and were much more rapid in their course than the others. Perforation sometimes occurred from gangrene of all the coats of the intestine, but usually involving large patches, and appearing to have resulted from the pressure of the lymph, deposited in the areolar tissue, obstructing capillary circulation. I have thus briefly and imperfectly presented, as I believe, three distinct lesions in this disease, encountered by me in different commands in widely separated parts of the country, the troops being exposed to different climates and zymotic influences, viz., the great exposure, incessant fatigue, and rigorous climate to which the 'Army of the Potomac' was exposed, coupled with the comparatively more luxurious life which its soldiers had previously led; the burning sands of the Texas coast, the absence of vegetables in the diet of the troops, and the consequent scurvy, and the moist heat and malarial dews of the Mississippi valley operating on the more hardy western men. In none of the cases examined by me did I discover hepatic abscesses, although I looked for them; but a constant phenomenon in all was great enlargement and induration of the mesenteric, and especially meso-colic glands; so much so as to resemble deposits of tubercle. This condition of these bodies must have greatly impeded the absorption of food into the system, or at least of certain articles such as the fats, and explains the great and progressive emaciation shown in those suffering from this disease. As to diagnosis, the question naturally arises whether it is possible to discriminate between these different forms of disease. I can only say that the cases were usually so far advanced by the time they were sent to a general hospital as to present the same list of symptoms in all cases." * * *

† See p. 296 *et seq.*, *supra*.

to the naked eye and the character of the histological changes it precisely resembles the thickening that occurs in cases of follicular ulceration. Hence the description to be presently given of that process, if read in connection with the remarks on chronic cases in the previous portion of the section just referred to, will give a sufficiently complete presentation of the anatomy of the non-ulcerative cases, and no further details with regard to this form of chronic inflammation are necessary in this place.

There is, however, a curious lesion occasionally encountered in such cases which deserves remark in this place. I allude to the development beneath the mucous membrane of small cysts containing a thick mucoid or glue-like fluid. These vary in size from $\frac{1}{10}$th to $\frac{1}{4}$th of an inch in diameter, and project from the surface in the form of hemispheres; they are sometimes observed in cases of well marked follicular ulceration, but also occur in cases in which no ulceration can be detected. The latter condition was noted in the specimen represented by the chromo plate facing this page. The patient was a confederate prisoner of war, who died of dysenteric diarrhœa of nearly three months' duration, which made its appearance while he was under treatment for a gunshot wound of the chest. The following is a brief history of the case:*

Case 899.—Private T. P. Coleman, company A, 19th Mississippi (confederate) volunteers; age 19; was wounded near Petersburg, Virginia, November 5, 1864, by a ball which passed through the lower portion of the left side of his chest, fracturing the eleventh rib and the transverse process of the eleventh dorsal vertebra, and probably wounding the lung. He was treated at first in a confederate hospital at Richmond, Virginia, and, May 6, 1865, was transferred to the hospital at Point Lookout, Maryland. Thence, July 24th, he was transferred to Armory Square hospital, Washington, D. C., and finally, August 17th, to Douglas hospital. The patient stated that on the reception of the injury he had a free hæmorrhage from the wound, spat blood and had great difficulty in breathing, but that he was doing well under treatment, when, about the beginning of June, while still at Point Lookout, diarrhœa set in and persisted in spite of treatment. When he entered Douglas hospital he was still suffering from diarrhœa, which was of a dysenteric character, and he was terribly emaciated. August 18th, the ball, which had lodged behind the tenth rib, about an inch and a half from the wound of entrance, was removed by Asst. Surgeon Wm. F. Norris, U. S. A. His dysenteric diarrhœa was treated by nitrate of silver, used both internally and by injection. He could hardly be prevailed upon to take beef tea or milk, which appeared to make him vomit, but he swallowed whiskey greedily, and it was freely administered. He was restless and noisy, but did not complain of dyspnœa, and had no cough. He sank rapidly, and died August 19th. *Autopsy* thirteen hours after death: The right pleural sac contained three ounces of sanguineous effusion, and there were old pleuritic adhesions on both sides. The lungs were crepitant, with the exception of the lower lobe of the left lung, which was converted into an abscess cavity containing detritus of lung substance, and the external walls of which were inseparably adherent to the costal pleura. The liver and kidneys were fatty; the spleen contained less blood than usual. The small intestine was pale; in the descending colon and the rectum the solitary follicles were enlarged, forming cyst-like vesicles the size of peas, with minute circular openings at their summits, and each containing a transparent gelatinous mass. History by Acting Assistant Surgeon Carlos Carvallo. [Specimens, viz: No. 660, Medical Section, and No. 1561, Surgical Section, (the injured ribs,) presented by Assistant Surgeon Wm. F. Norris, U. S. A.]

The diseased intestine was brought to the Museum immediately after the autopsy, and a water-color drawing, representing a portion of descending colon, was made by Mr. Hermann Faber; the chromo plate is a reproduction of this drawing. The colon was moderately thickened; the general surface of its mucous membrane was pearl-gray, with greenish and bluish streaks and patches. There were also a number of reddish patches in which congested bloodvessels could be distinctly recognized by the naked eye. The cysts varied in size from $\frac{1}{10}$th of an inch or less to $\frac{1}{4}$th of an inch in diameter; for the most part they were of a bluish color, which in the larger cysts became a dark indigo-blue. At the apices of some of them the yellowish contents shone through, or protruded through tiny circular orifices; these contents could readily be expelled by pressure, and resembled drops of warm boiled

* The history of this case is also given in the first Surgical Volume, p. 568. The account there presented differs from that in the text in stating the diarrhœa to have commenced "about the middle of June," and in speaking of the solitary glands of the colon as "ulcerated." The latter statement is certainly an error, as shown by the specimen, and the former is probably so, as the case-book of the hospital explicitly says "about the beginning of June." Both errors occur in the history, sent to the Museum with the specimens, from which the account in the Surgical Volume was taken, while the history as given above was extracted from the case-book of the hospital, which is the original record.

glue. The cysts were very unequally scattered over the mucous surface; in some places they were so close as to be in contact; in others they were an inch or more apart. No ulceration was detected anywhere. The minute anatomy of these cysts will be discussed in a subsequent part of this section.

A very similar specimen to that just described is represented in the plate facing page 514, which is reproduced from a photograph of No. 602, Medical Section, and represents the specimen after it had been preserved in alcohol for some time. The following history of the case was furnished by Acting Assistant Surgeon George K. Smith:

CASE 900.—Private Thomas Kelcher, company E, 28th Massachusetts volunteers; age 29; Irish; enlisted August 1, 1864 March 25, 1865, he received a gunshot fracture of the left thigh in action near Petersburg, Virginia. He was admitted to the depot field hospital of the Second Army Corps, City Point, Virginia, and on the 31st was sent on board the steamer State of Maine for transfer to Washington. He was admitted to Armory Square hospital, Washington, D. C., April 1st. On examination it was found that the ball had entered the external surface of the left thigh at the junction of its middle and lower thirds, and passing transversely inwards comminuted the femur, and made its exit on the internal surface opposite the wound of entrance. April 2d, he was etherized, the wound of entrance enlarged, and five fragments of bone removed. When admitted to Armory Square this man had an abscess at the lower border of the left popliteal space, caused by the pressure of the end of a splint which had been applied to the posterior surface of the thigh. This caused so much pain and soreness that he could not at first bear extension, but at the end of the month of April this trouble was so much better that he was able to bear extension well. May 10th, he was attacked with dysentery, the stools containing mucus but no blood, and this continued until his death, with the exception of two or three short intervals. June 15th, he was doing remarkably well; appetite good, tongue clean and bowels regular; but, July 1st, he had a return of the dysentery, which was not subsequently benefited by treatment. July 25th, the injured limb was attacked by erysipelas, and for a little distance around the wound, not exceeding half an inch at any point, it presented the appearance of gangrene. This was treated by the application of solution of bromine. The limb was considerably swollen, and the patient felt great pain near the ankle joint. July 29th, a large patch of the epidermis over the left ankle was raised, and the space beneath filled with dark-colored serum. The true skin presented the bluish color seen in the first stage of gangrene. This appearance continued to extend up the limb until his death, on the following day. The night before his death he had a severe pain in his left side, indicative of pleurisy. *Autopsy* 8 hours after death: Rigor mortis well marked. The apex of each lung was studded with tubercles. The posterior surface of the lower part of the left lung was covered with lymph, and the pleura at this point was highly inflamed. The heart was normal; the stomach and small intestine were also normal. The mucous membrane of the large intestine throughout its whole extent presented numerous ulcers about a quarter of an inch in diameter, and in the descending portion there were a large number of cysts containing lymph, some of which appeared to be undergoing ulceration, while others, already perforated, were filled with pus. The femoral and iliac veins of the injured side were completely filled with a firm fibrinous clot extending from the knee to the vena cava ascendens. The fractured femur was firmly united, with three-quarters of an inch shortening. [Specimens Nos. 602 and 603, Medical Section, are portions of the colon in this case, and No. 1105, Surgical Section, is the fractured femur.]

The large intestine from this case was brought to the Museum immediately after the post mortem examination. When received its mucous surface was of a pale cream color, with livid bluish discoloration around the cysts. These contained a semi-transparent yellowish matter resembling calves'-foot jelly, in which, with the microscope, a few delicate nucleated cells resembling the white corpuscles of the blood were observed to be imbedded. This substance was undoubtedly what is described as pus in the history of the case given below. Many of the cysts had ruptured and their contents escaped, leaving cavities resembling follicular ulcers. I found no other ulcers in any part of the specimen. The specimen, No. 602, Med. Section, represented in the photo-plate, is a portion of the transverse colon, exhibiting some fifty of the cysts described; the action of the alcohol has caused them to collapse, but their position and dimensions can still be recognized; several have so ruptured as to be converted into the cavities just described. No. 603, Medical Section, is a portion of the descending colon from the same case; it contains a small number of similar cysts, and also presents a number of small, irregular, oval cicatrices, such as result from the healing of follicular ulcers. A few of these cicatrices can also be recognized in the photo-plate by the help of a lens.

In both the cases just described the death of the patient was undoubtedly hastened by the gunshot wound. Similar specimens, however, are preserved in the Museum from two

other patients, in which this was not the case. The first is case 173,* an example of chronic flux, the exact duration of which is not recorded, but the patient was admitted to general hospital for "chronic diarrhœa" about two months before his death. He had pleurisy and limited pleuropneumonia on the left side, and was erroneously supposed to be suffering from phthisis as well as diarrhœa; he became extremely emaciated before death. In this case, besides cysts similar to those just described, follicular ulceration had taken place in the thickened colon, and the picture was still further complicated by the fact that the diphtheritic process had set in just before death, so that the lower fifteen inches of the ileum and much of the large intestine between the ulcers were plastered with pseudomembrane. Nos. 56, 57, 58 and 59, Medical Section, are portions of the colon from this case.

The remaining example of this cystic lesion is case 433,† in which the patient suffered from intermittent fever as well as a chronic flux; he died three months after admission to hospital for the treatment of his diarrhœa.‡ No. 527, Medical Section, is a portion of the colon from this case; in which, besides thickening of the colon and cysts similar to those in the previous cases, a number of follicular ulcers were found, and shreds of pseudomembrane adhered to the mucous surface between the ulcers and cysts, as if the diphtheritic process had commenced before death.

The peculiar cystic lesion exhibited in these cases was described and figured by Stark in 1766.§ A somewhat similar case is figured by Cruveilhier in his great work,‖ but the patient, although he complained of colic and digestive disorders, had no diarrhœa until a few days before death; on the contrary, he complained rather of constipated bowels: Cruveilhier believed the cysts to be seated in the solitary follicles. Still another case has been reported by Virchow,¶ which resembled Cruveilhier's in that some of the cysts were pedunculated, but the others in that the patient had suffered from a chronic flux. He found on making thin sections of the intestine in this case that the cysts were not seated in the solitary follicles, but resulted from cyst-like dilatation of the lower portion of the glands of Lieber-

* Page 119, *supra*. † Page 186, *supra*.

‡ In the history of this case, on p. 186, private John Fulton, company B, 16th Pennsylvania cavalry, is reported to have been admitted to Emory hospital November 14, 1864, and died December 27th. Since printing that part of the work the following additional facts have been discovered: Private Fulton was admitted to the field hospital of the 2d division cavalry corps before Petersburg, Virginia, October 25, 1864. Diagnosis recorded "diarrhœa." October 26th, he was transferred to the depot hospital of the cavalry corps, City Point, Virginia, where he is again reported as suffering from diarrhœa. November 12th, he was transferred to general hospital.

§ WM. STARK—*Septem historiæ et dissectiones dysentericorum*, Leyden, 1766, Plate I, Fig. 2, and Plate II, Figs. 3 and 4. The patient was a woman, aged 27, who, after a quotidian remittent fever of two months' duration, was seized by a severe diarrhœa, of which she died about six weeks later. The lower part of the ileum and the whole large intestine presented considerable numbers of cysts, at the apices of which there was a pellucid point through which a translucent gelatinous matter could be expressed, [Hist. 2, p. 3.] In another case of chronic flux [Hist. 3, p. 8] in a man, aged 54, very many little round foramina with red edges, (follicular ulcers, or ruptured cysts,) and a few little hemispheres emitting a pellucid gelatine on pressure, (cysts,) were found in the colon. One of these, nearly half an inch in diameter, found near the anus, is figured in Plate II, Fig. 5.

‖ J. CRUVEILHIER—*Anat. Path. du Corps Humain*, T. II, Paris, 1835–42, Livraison 34, Plates 2 and 3. This remarkable case was originally published by BRIQUET, in the journal L'Institut Méd., July 15, 1839, under the title *Obs. d'adénite chronique avec altérotion spéciale des follicules muqueux du tube digestif*. The patient was a man 41 years old. The case was diagnosed during life as chronic enteritis. In the colored lithographic plates some of the cysts are bluish, and strikingly resemble those figured in the chromo plate facing p. 512, but many of them were pedunculated—an accident which was not observed in any of the cases in the text. Similar cysts were numerous throughout the whole small intestine. The patches of Peyer were thickened and of an indigo-blue color. The cysts were filled with a mucus resembling that which coats the intestines. The author remarks: "j'ai été conduit à les considérer comme kystes muqueux, formés par le développement des follicules intestinaux." The plates illustrating this case have been copied by ALBERS—*Atlas der path. Anat.*, Abth. IV, Bonn, 1862, Tab. XI and XII.

¶ R. VIRCHOW—*Die Krankhaften Geschwülste*, Bd. I, Berlin, 1863, S. 243 and Fig. 39. The patient was a boy, aged 15, who died of chronic dysentery accompanied by liver cirrhosis and dropsy. The wood-cut is an excellent one. H. LEBERT—*Traité d'Anat. Path.*, T. II, Paris, 1861, p. 316; also Atlas, Plate 122, Figs. 1 and 2; and H. LUSCHKA—*Ueber polypöse Vegetationen der gesammten Dickdarmschleimhaut*, Virchow's Archiv, Bd. XX, 1861, S. 133; also Plate 3, have each described cases of chronic flux in which polypoid excrescences similar to those figured by CRUVEILHIER and VIRCHOW projected from the colon; but in their cases the polypi were solid, not cystic. In LEBERT'S case the little tumors were composed of a fibroid matrix in which elongated nuclei were imbedded; no glands were recognized in their substance. In LUSCHKA'S case naked roundish nuclei and nucleated cells, some of which had two nuclei, were imbedded in a partly fibrillated partly granular matrix, but a large part of each tumor was composed of the tubular glands of the intestine, (see Plate 3, Fig. 2.) VIRCHOW, *loc cit.*, speaks of these cases as *colitis polyposa*, and regards them as nearly related to his own case, which he describes as *colitis cystica polyposa*. LUSCHKA mentions that he himself has observed the cystic form in a girl 5 years old dead of chronic dysentery. VIRCHOW [*vide supra*] refers also to a case reported and figured by MENZEL—*Acta Med. Berol.*, T. IX, 1721, p. 78, and Fig. 4—which, however, I judge, from the curious etching by which it is illustrated, is rather similar to the cases of LUSCHKA and LEBERT than to the cystic forms. It is headed, "De excrescentiis verrucoso cristosis copiosè in intestinis crassis dysenteriam passi observatis." The patient was a soldier who died of dysentery.

*Heliotype.*

TRANSVERSE COLON WITH CYSTS.

No. 602. MEDICAL SECTION.

kühn, several of which usually coalesced to form one of the cysts seen with the naked eye. It will be shown further on that in our own cases the cysts also originated in these glands, but only after they had invaded the solitary follicles by a process which is of frequent occurrence in chronic intestinal catarrh.*

*Chronic inflammation accompanied by follicular or other ulcers.*—This process in its most exquisite development always involves the large intestine, but it sometimes extends for some distance into the lower part of the small. The development of the ulcers is preceded or accompanied by more or less thickening of the mucous and submucous layers, especially the latter, sometimes even of all the intestinal coats. When this thickening is considerable the colon is usually much contracted, so that its lumen is abnormally small, and when grasped by the hand during the autopsy feels hard and rigid. The contraction sometimes involves the whole length of the large intestine; in other cases it is limited to certain parts only, while others are preternaturally dilated. More or less extensive peritoneal adhesions very frequently bind the large intestine in these cases to the abdominal parietes or the adjoining viscera. In sections of such intestines cut perpendicularly to the mucous surface the several coats can be distinctly recognized by the naked eye, and the submucosa, sometimes the $\frac{1}{8}$th of an inch or more in thickness, presents a peculiar whitish translucent or lardaceous appearance which is quite characteristic. Two kinds of ulcers can usually be observed: follicular ulcers, and ulcers which originate independently of the closed follicles in the mucous membrane between them.

The *follicular ulcer* in its earliest stages may be recognized by the fact that it is seated at the apex of an enlarged follicle, where it appears as a tiny irregular excavation. At a later period the affected gland is entirely destroyed by ulceration, and the ulcer appears as a little cavity in the submucous layer which communicates with the surface by a constricted orifice. Subsequently the ulcer extends in the submucosa, undermining the mucous membrane, which perishes in proportion as its nutritive supply is cut off from beneath, and the orifice thus enlarges as well as the ulcer. Still later, adjoining follicular ulcerations often coalesce, forming large irregular excavations, by which, in extreme cases, a large portion of the mucous membrane of the colon is destroyed. These ulcers never present the beveled edges of those which result from diphtheritic sloughing, but always, unless complicated by this latter process, have overhanging edges, from the fact that they spread more rapidly in the submucosa than in the mucous membrane. Seen from the surface in their earlier stages the follicular ulcers appear as rounded or oval orifices $\frac{1}{10}$th to $\frac{1}{4}$th of an inch or more in diameter, which look almost as though they had been cut into the thickened intestine by a shoemaker's punch; and this abrupt character is observed also in the larger and more irregular ulcers which are found at a later stage of the process. Both these ulcers and those next to be described may be spoken of as catarrhal ulcers, to distinguish them from those resulting from the diphtheritic process.

Intestines invaded by follicular ulceration usually present a certain number of other *ulcers unconnected with the follicles.* These appear at first as superficial erosions by which more or less of the thickness of the mucous membrane is destroyed; ultimately, however, they invade the submucous connective tissue. They are generally quite small, but sometimes cover a considerable area. These larger ulcers are so similar to those which result from the separation of diphtheritic sloughs that it is sometimes quite difficult to distinguish

* See pp. 328 and 465, *supra*.

between them. There is a curious and by no means frequent variety of the smaller ones, in which they appear as superficial circular erosions around the solitary follicles, which remain intact as central eminences. No. 406, Medical Section, Army Medical Museum, is an example of this lesion. The specimen was obtained from case 310;* its microscopical characters will be commented upon hereafter.

Both the forms of colon ulcers described may invade the muscular coat, and, penetrating more and more towards the peritoneal surface, may finally perforate it, giving rise to fæcal extravasation. Both forms may also be observed in the lower part of the small intestine in some of the cases of chronic flux in which they exist in the colon. The follicular ulcers, which are usually associated with more or less thickening of the submucous layer and clavate hypertrophy of the villi, appear as small, rounded or oval punched-out depressions. Sometimes one or more of the follicles in a Peyer's patch are destroyed without material thickening of the rest of the same patch, which, however, is generally the seat of pigment-deposits, [see the plate facing page 302, which represents No. 600, Medical Section.] The non-follicular ulcers appear as irregular erosions of the mucous surface, of variable dimensions, by which the villi and a part or the whole of the glandular layer are destroyed.

In cases of chronic inflammation of the intestine, accompanied by follicular ulceration, the diphtheritic process frequently supervenes and complicates the pathological picture. We may thus see all stages of diphtheritic inflammation between the characteristic follicular ulcers. In very many instances this complication proves so promptly fatal that on post mortem examination only pseudomembranous frosting or patches can be seen, or at most a somewhat extensive pseudomembranous layer on the mucous surface between the ulcers; but occasionally the patient survives until sloughing occurs, and then it is almost impossible to distinguish the nature of the primary lesion. Finally, under favorable circumstances the catarrhal ulcers readily cicatrize, giving rise, when the ulcers are small, to peculiar stellate cicatrices, which are found not only, when opportunity occurs, after recovery from chronic fluxes, but also in fatal cases between the unhealed ulcers.

From the material at my disposal I have selected several specimens to illustrate the characteristic appearances of follicular ulceration of the colon.† The plate facing this page is reproduced from a photograph of No. 206, Medical Section, which is an exceedingly well marked specimen of uncomplicated follicular ulceration of the colon. The original memo-

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* Page 151, *supra*.

† The earliest plates representing the follicular ulceration of the intestines of chronic fluxes that I have seen are those of WM. STARK, [*op. cit.*, p. 441, *supra*,] who has figured follicular ulcers of the colon in Plate I, Fig. 6, from a case (Hist. 5) of chronic flux in a soldier 50 years old, who had contracted the disease in the East Indies. Plate I, Figs. 7 and 8, of the same work, represents small follicular ulcerations of the ileum, some affecting individual follicles in a Peyer's patch, others the solitary follicles. The specimen was taken from the body of a sailor, 46 years old, (Hist. 7.) who had long suffered from a chronic flux; many similar ulcers and some large ones existed in the cæcum. Death was caused in this case not by the flux, but by obstruction of the bowels due to the development of a fungous growth in the rectum, the nature of which can only be conjectured. BAILLIE, [*op. cit.*, p. 444, *supra*,] Case. IV, Plate II, Fig. 4, gives a good representation of follicular ulcers of the colon from Mr. Hunter's museum—no history. ANNESLEY [*op. cit.*, p. 444, *supra*] gives two colored lithographs, which, I judge, represent follicular ulcers of the colon. Plate XXXII represents acute catarrhal dysentery with small follicular ulcers, and Plate XXXVIII represents a characteristic thickened colon with follicular ulcers from a case of chronic flux. CARSWELL [*op. cit.*, p. 444, *supra*] gives two colored lithographs, which illustrate follicular ulceration of the colon. The first—Softening, Plate II, Fig. 4—is a pale anæmic-looking piece with small ulcers, very similar to that from the case of J. Leonard, [see p. 517, *infra*.] No history of the case is given. The second—Melanoma, Plate IV, Fig. 3—I judge to represent large follicular ulcers with hæmorrhage into the cavities of the ulcers and the substance of the mucosa. The specimen is said to have been taken from a person who had long suffered with dysentery. GLUGE, [*op. cit.*, p. 444, *supra*,] Bd. II, Lief 18, Taf. 3, Fig. 4, gives a colored lithograph representing follicular ulceration of the colon, and LEBERT [*op. cit.*, p. 444, *supra*] gives in his beautiful Atlas six copperplate figures, two of them colored, which are, on the whole, the best of the representations enumerated. They are, Plate 116, Fig. 5, large intestine of a tuberculous woman, who also had Bright's disease; Plate 117, Fig. 7, colon from a case of chronic dysentery; Plate 118, Figs. 1 and 2, colon showing enlarged solitary follicles, as well as follicular ulcers, from a case of chronic dysentery; Plate 118, Figs. 3 and 4, described as dysenteric intestine, without stating whether the disease was acute or chronic. Observe the remarks at the conclusion of the note to p. 444, *supra*. I may add to the foregoing, two lithographic plates prepared to illustrate the Catalogue of the Medical Section of the Army Medical Museum, Washington, 1867. The first, facing p. 72, represents small follicular ulcers in the descending colon, from No. 64, Medical Section, [see case 134, p. 111, *supra*.] The second, facing p. 80, represents a portion of the colon, No. 224, Medical Section, [see case 266, p. 143, *supra*,] in which there are numerous minute follicular ulcers and five large irregular erosions formed by their extension. The mucous membrane between the ulcers is plastered with pseudomembrane.

*Heliotype.* *James R. Osgood & Co.*

FOLLICULAR ULCERATION OF THE COLON.

No. 206 MEDICAL SECTION.

randum has unfortunately been mislaid, and it is only known that the specimen was taken from the body of a soldier said to have died of "chronic diarrhœa" in one of the hospitals in Washington during 1863. The colon in this specimen is much thickened, and numerous follicular ulcers exist, which appear in the plate as round or oval orifices leading to dark cavities; they vary in size from mere points to the tenth of an inch in diameter, or larger. Near the centre of the piece some of them have coalesced, forming ulcers of greater size, the largest nearly half an inch in diameter; at the bottom of these larger ulcers the circular muscular coat of the intestine is laid bare.

The chromo plate facing page 518 represents a thickened anæmic-looking portion of colon, on the surface of which there are a great number of small follicular ulcers. The following is a memorandum of the case from which the specimen was taken:

CASE 901.—Private Jacob Leonard, 27th New York battery, while doing duty with his regiment in the army of the Potomac, was attacked with chronic diarrhœa, which was treated with variable success for several months. He finally broke down, and was admitted, August 28, 1864, to the field hospital of the first division, 9th army corps, where the diagnosis recorded was "dropsy," which had by this time become a prominent feature of the case, for, when the patient was transferred, August 31st, to the depot hospital of the 9th corps, City Point, Virginia, the diagnosis there entered on the register was "ascites and anasarca." September 8th, Leonard was sent north, and next day was admitted to Douglas hospital, Washington, D. C., where the diagnosis recorded was "scorbutic diarrhœa." He died September 16th. No further details of the case, or of the appearances observed during the autopsy, have been recorded.

The plate is a reproduction of a water-color drawing made at the Museum by Mr. H. Faber immediately after the autopsy. The mucous surface of the colon is of a pale cream color, with pale-bluish and reddish patches. The ulcers are numerous, and vary in size from mere points to the tenth of an inch in diameter. Nearly the whole of the colon was brought to the Museum, and the piece fairly represents the condition of all parts of it.

The chromo plate facing page 520 represents follicular ulcers of the colon fringed with pseudomembrane. The following is an account of the case:

CASE 902.—Corporal Ephraim Campbell, company D, 150th Pennsylvania Volunteers; age 24; was admitted to the field hospital of the first division, fifth army corps, near Petersburg, Virginia, September 12, 1864. Diarrhœa: for which he had been treated in his regimental hospital. September 14th, he was transferred to the hospital of the 3d division, fifth corps, and September 29th, to the depot hospital of the fifth corps, at City Point, Virginia, where the diagnosis recorded was fever. Thence he was transferred to Columbian College hospital, Washington, D. C., where he was admitted, October 30th, suffering from all the symptoms of chronic diarrhœa. He was extremely emaciated, pulse 110 and small; had five or six loose dejections daily, and no appetite. Ordered hot fomentations to be applied to the abdomen, with rest in bed, and a diet of boiled milk and beef tea. November 2d, he reports that he feels better than on admission, and begins to relish his food a little, but the diarrhœa continues unabated. R. Chalk mixture three ounces, fluid extract of ginger half an ounce, tincture of cinchona one ounce; take a tablespoonful three times a day; continue the hot fomentations; extra diet. November 6th: Since the last note the patient has been better, but to-day is worse again. His bowels are moved every hour, and the dejections are mixed with blood; pulse 110 and thread-like; abdomen tympanitic. His strength is less than yesterday; no appetite. Continue diet and treatment, with the addition of laudanum enemata. November 7th: The bowels are moved less frequently. The patient rested well last night, and has some appetite. Continue treatment. November 9th: Pulse 100; bowels again very loose, the dejections contain mucus and blood; appetite poor. Continue treatment. November 11th: The symptoms continue with little change, except that the patient complains of a dry cough at night; there is, however, no pain in the chest, and the respiration appears to be normal. Continue treatment, with the addition of a cough mixture containing syrup of senega and paregoric. November 14th: Pulse 96, skin dry and harsh, respiration 20 per minute, cough not so dry. The bowels were only moved twice since yesterday morning; appetite very poor. Continue treatment. November 15th: Pulse 108, respiration 32, bowels moved twelve times since yesterday morning; the dejections are bloody, strength failing, no appetite. R. Brandy four ounces, carbonate of ammonia two scruples; take a tablespoonful every three hours; beef tea. November 16th: Pulse 100, respiration 32, bowels very loose, strength failing fast. Continue treatment and diet. Died November 18th. *Autopsy* nine hours after death: Body very much emaciated. The right pleural cavity contained one gallon of sero-purulent fluid. The right lung was collapsed, coated with lymph and carnified. The left lung was normal. There was a large abscess in the upper portion of the liver which communicated with the pleural cavity through an opening in the diaphragm three by four inches in diameter. The fifth, sixth and seventh ribs were denuded of periosteum and bathed in pus. The omentum was quite devoid of fat. The mesenteric glands were enlarged. The spleen was normal. The mucous membrane of the lower portion of the ileum was coated with pseudomembrane and presented a number of small follicular ulcers. Peyer's patches were slightly thickened. The cæcum and colon were thickly studded with follicular ulcers, the edges of many of which were covered with pseudomembrane.—Acting Assistant Surgeon A. H. Wilson, U. S. A. [Nos. 433–437, Medical Section, Army Medical Museum, are from this case.]

The specimens from this case were brought to the Museum immediately after the autopsy, and a drawing in water colors representing a portion of the descending colon was made by Mr. Hermann Faber. The plate is a reproduction of this drawing. The mucous surface is seen to be generally reddened, with grayish streaks and patches. There are a considerable number of follicular ulcers, the smallest of which are rounded and very minute, while the larger ones, varying from $\frac{1}{10}$th to $\frac{1}{4}$th of an inch in long diameter, are usually oval; the edges of most of these ulcers are fringed with curdy yellow pseudomembrane. The submucous tissue was considerably thickened, as is well shown on the left hand of the piece near the bottom where its edge comes into view. This specimen has been preserved in the Museum, No. 437, Medical Section. The other specimens from the same case are: No. 436, the appendix vermiformis and a part of the cæcum, showing similar ulcers; No. 433, the collapsed right lung, thickly coated with pseudomembrane; No. 435, a portion of the liver, showing a large abscess cavity on its upper surface; and No. 434, the seventh rib, showing the effects of the burrowing of the pus from the abscess in its efforts to escape; the pulmonary surface of the bone is denuded of periosteum, and presents several flat new-formations of bony tissue. It would appear that in this case the large hepatic abscess entirely escaped observation during life, and the remark in the history of the case, on the 11th of November, only a week before death, that "the respiration appears to be normal," is worthy of note in connection with the considerable pleuritic effusion and collapse of the right lung, both of which undoubtedly existed before that time.

The plate facing page 522 is a reproduction of a photograph representing No. 279, Medical Section. The following is an account of the case:

CASE 903.—Private Frederick Wirth, company G, 72d Pennsylvania volunteers; enlisted August 10, 1861. According to the muster-roll of his company he was excused from duty on account of sickness after the 30th of April, 1862. He appears on the hospital record of his regiment admitted June 19, 1862; disease not stated; returned to duty June 23d. July 26th, he was admitted to Satterlee hospital, West Philadelphia; diagnosis chronic dysentery. Died August 3d. *Autopsy* next day, by Dr. Joseph Leidy: The organs of the chest were healthy. The liver, stomach and spleen appeared normal. The mucous membrane of the ileum and the agminated glands were inflamed and thickened, but not ulcerated. The mucous membrane of the colon was inflamed, especially towards the two extremities; the middle portion was mottled, red, gray and slate-colored; the extremities were dark red. Throughout its entire extent there were innumerable ulcers about the size of peas, many of them extending to the muscular coat. [No. 279, Medical Section, Army Medical Museum, is from this case.]

The plate shows, besides numerous follicular ulcers of characteristic form and appearance, many small patches of firmly adherent pseudomembrane on the mucous surface of the intestine between the ulcers.

A somewhat similar condition, except that the follicular ulcers are less numerous and some of them larger, is represented in the chromo plate facing page 524. The patient was a soldier who died in Judiciary Square hospital during the summer of 1863. His disease was recorded as chronic diarrhœa. The specimen represents a portion of the descending colon, and is reproduced from a drawing made at the Museum by Mr. Hermann Faber. The colon was much thickened ($\frac{1}{5}$th to $\frac{1}{4}$th of an inch in thickness) and considerably contracted. The mucous surface was of a bright red color, not unlike that of a granulating wound. It presented a number of small follicular ulcers, some of them round, others stellate, and some larger ulcers apparently resulting from the extension of the smaller ones; these ulcers for the most part had blackened bases. Thin patches of yellowish pseudomembrane adhered in places to the mucous surface between the ulcers, the expression of a diphtheritic inflammation by which the original follicular ulceration has been considerably obscured. Unfortunately no history of the case was preserved.

The extreme dimensions of the erosions, which occasionally result from the extension of follicular ulcers, are well illustrated by the plate facing page 526, which is a reproduction of a photograph of No. 195, Medical Section. The following is an account of the case:

CASE 904.—Sergeant A. L. Manchester, company E, 152d New York volunteers; age 23; was enlisted September 27, 1862, and continued to do duty with his company until March, 1863. During much of this time he had diarrhœa, which, however, did not prevent him from remaining on duty. March 2d, being then on duty as one of the guard at Douglas hospital, Washington, D. C., he was attacked by measles, with dry skin, pulse 110, and dark tongue. At the time of this attack he was a good deal broken down by the disorder of his bowels, and when, on the 5th of March, he was transferred to a bed in the hospital, the entry in the register was "measles and enteritis." The stools had been comparatively painless, but, March 7th, tormina and tenesmus supervened and they became bloody; they did not, however, exceed ten in twelve hours. These symptoms gradually abated under the use of a chalk mixture with opiate suppositories, and by the 12th of March the stools were reduced to four in the twenty-four hours, and were no longer bloody; skin moist; tongue cleaner; pulse 70, but quite feeble; the patient began to eat, and was now free from tenesmus and abdominal pain. March 20th: Is much better; pulse 84 and stronger; he sits up; has milk and eggs for diet; the remedies employed seem to control the tendency to pain and straining; the latter symptom appears to be kept in check by the use of the suppositories mentioned above. March 22d: Appetite better; only three painless passages in the last twenty-four hours; pulse 81; skin natural; tongue coated; slight tenderness on pressure in the left inguinal region. March 28th: Not so well; pulse 110; skin natural; has had about four stools daily for the last few days; they are dark-colored and stringy; tongue coated with a brownish fur; increased tenderness in left inguinal and lumbar regions. March 29th: Pulse 125; skin dry; tongue coated, but not so thickly as yesterday. Ordered quinia and milk punch. March 30th: Continual bilious vomiting set in, which was somewhat relieved by creasote, but it recurred from time to time, and death ensued April 1st. Stimulants, beef tea, &c., had been freely used during the last week of life. *Autopsy:* The small intestine near the ileo-cæcal valve was inflamed; higher up it was healthy. The large intestine was extensively inflamed and ulcerated.—Acting Assistant Surgeon Henry L. W. Burritt. [Nos. 191 and 195, Medical Section, Army Medical Museum, are from this case.]

The plate represents a portion of descending colon, which exhibits a number of the small, oval, characteristic follicular ulcers, but shows besides a number of large irregular ulcers with overhanging edges. The largest of these are more than an inch in diameter. It is probable that follicular ulceration had existed in this case for some time before the patient was attacked by measles, and that in consequence of the adynamic condition induced by that disease the ulcers rapidly extended. This seems to have been effected by a simple ulcerative process quite independent of any diphtheritic inflammation, and the specimens afford an excellent illustration of the great size to which catarrhal ulcers sometimes extend. No. 194, Medical Section, is taken from higher up the same colon, and exhibits similar lesions but in a less marked degree.

As already mentioned, under favorable conditions catarrhal ulcers readily cicatrize. Where great loss of substance has taken place I know of no well ascertained peculiarities by which the resulting cicatrices can be distinguished from those of the diphtheritic ulcer. But in the case of small oval follicular ulcers the cicatrices are quite characteristic. The process of cicatrization appears to begin at the bottom and sides of the ulcer by the development of a delicate vascular granulation tissue, by which the space beneath the overhanging edges is first filled up and the cavity of the ulcer gradually becomes diminished in depth. With the first contraction of the cicatricial tissue the edges are approximated to the muscular coat and afterwards to each other, so that the resulting cicatrix would be much smaller than the original ulcer but for the fact that a similar cicatricial tissue is generally developed simultaneously between the tubular glands of the adjacent inflamed mucous membrane, by which numerous radiating, anastomosing ridges are formed, giving a stellate figure to the cicatrix. Including the space occupied by these ridges the area of the cicatrix remains finally quite as large, or even larger, than that of the original ulcer; but with the aid of a lens it is easy to make out the orifices of the glands of Leiberkühn between the ridges, and thus to recognize that this portion of the scar is not mere cicatricial tissue, but a peculiar modified condition of the mucous membrane.

The plate facing page 528 gives an excellent idea of the appearances presented by these characteristic cicatrices. It is reproduced from a photograph of a portion of No. 603, Medical Section. The specimen represented is from the case of Thomas Kelcher, related on page 513. In that case the patient, while under treatment for a gunshot fracture of the thigh, suffered an attack of acute catarrhal dysentery which passed into a chronic flux. His colon presented a number of cysts, containing a jelly-like substance; these were fully described in the place referred to, and are represented in the plate facing page 514, which is reproduced from a photograph of No. 602, Medical Section. But between these cysts and the ulcer-like cavities formed here and there by their rupture there were a considerable number of stellate cicatrices. Several of these cicatrices can be recognized in the plate just mentioned as representing No. 602, Medical Section. The photograph of a portion of No. 603, reproduced in the plate now described, was taken one-half larger than nature in order that the surface details might be better seen. In the portion reproduced there are several small, deep, oval cavities which represent the ruptured cysts just referred to. The surface of the intestine exhibits, besides, rather more than a dozen stellate cicatrices, some four or five of which form a conspicuous group near the centre of the plate. Each cicatrix consists of a central smooth area, oval or almost linear in shape, and varying in the specimen from one-twentieth to one-fifth of an inch in long diameter. From this central smooth portion radiate numerous delicate sinuous ridges, which sometimes branch and sometimes anastomose. In the plate, almost as well as in the specimen, the orifices of the glands of Lieberkühn can readily be recognized with a lens in the interspaces of the network formed by these radiating ridges.

Cicatrices quite like these are occasionally seen in cases of follicular ulceration of the colon that must be regarded as steadily progressing. Some of the ulcers cicatrize while others are still spreading, or new crops of ulcers make their appearance while those formed first are healing. The colon in case 543* afforded a striking illustration of this possibility. The patient died of a chronic flux in the course of which he became exceedingly emaciated. His colon was studded with follicular ulcers from the ileo-cæcal valve to the anus. A portion of this colon was preserved in the Museum, No. 673, Medical Section. It presents numerous punched-out follicular ulcers very similar to those represented in the plate facing page 522. There are also some larger erosions, and here and there some little pseudomembranous frosting. Everywhere between the ulcers, except where the pseudomembrane obscures the surface, there were numerous cicatrices exactly similar to those shown in the plate just described. Extensive puckering of the mucous surface, resulting in a diminution of the lumen of the intestine or even in intestinal stricture, occurring from the cicatrices of catarrhal ulcers, has been described by Rokitansky,† but I have never witnessed it.

*Extensive ulceration of the large intestine, the result of sloughing during a previous attack of acute diphtheritic dysentery.*—This condition is very often encountered in subjects dead of a chronic flux. I can add nothing to the descriptions already given‡ of the lesions found in such cases. Ulcers of the most various size and depth, some or all of which may exhibit different degrees of the process of cicatrization,§ may be met with. Nothing more need be done in this place than to refer the reader to what has been already said in describing the morbid anatomy of diphtheritic dysentery.

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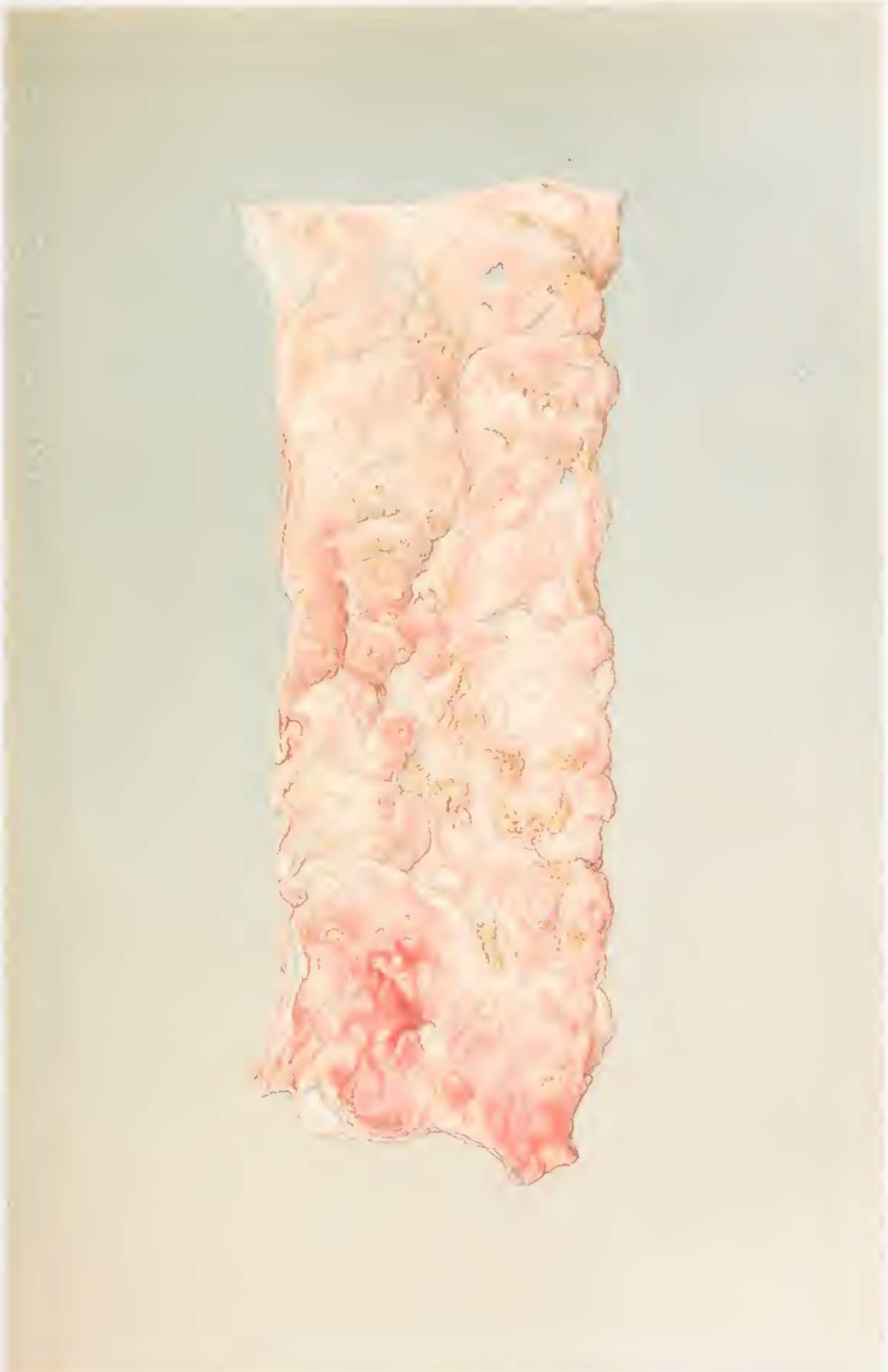
* See page 203, *supra*.

† *Lehrb. der Path. Anat.*, Bd. III, Vienna, 1861, S. 203.

‡ See p. 448 *et seq.*, *supra*.

§ See p. 451, *supra*.



ANALYSIS OF AUTOPSIES REPORTED IN PREVIOUS SECTIONS.—A brief analysis of the cases reported in the previous Sections, in which the intestines were ulcerated, exclusive of those grouped above under the head of diphtheritic dysentery, and of those to be discussed hereafter under the head of tubercular diarrhœa, will here be presented. In the first place, I note that in cases 163, 164, 174, 210, 531 and 854, although the disease is reported as diarrhœa or chronic diarrhœa, it was really some form of continued fever in which the typhoid affection of Peyer's patches was the prominent lesion, as is clearly shown by the record of the autopsies, and in cases 163 and 210, by specimens preserved in the Army Medical Museum. Cases 836 and 837, reported as chronic diarrhœa, and case 838, reported as typhoid dysentery, although much more imperfectly recorded, were probably of the same nature. These cases might have been postponed to the chapter on fever, but they have been allowed to remain as reported, in order to illustrate a class of errors of diagnosis which were no doubt of frequent occurrence.

Case 854 is particularly instructive. The patient was attacked, September 10, 1863, by intermittent fever, the symptoms of which were replaced after about a week by those of acute dysentery, after which the symptoms of diarrhœa and dysentery alternated. Death took place November 10th. The autopsy, which is reported in considerable detail by a careful observer, shows that characteristic typhoid ulceration of Peyer's patches was present in the ileum, associated, as is so often the case, with catarrhal inflammation and a moderate degree of follicular ulceration of the colon. I cannot attach much importance to the remark that the disease of Peyer's patches was "not so extensive near the cæcum as is usual in typhoid fever," in view of the extent to which they actually appear to have been diseased in the rest of the ileum, and must regard the case as one of those hybrid cases of fever, beginning as intermittent and ending as typhoid, to which I have given the name typho-malarial. The dysenteric phenomena which chiefly attracted the attention of the medical attendant are explained by the intensity of the accompanying catarrhal ulceration of the colon. The contrary error of mistaking diarrhœa or dysentery during life for typhoid fever was at least equally common.

Passing by these erroneously reported histories, the cases here to be discussed may be divided into two classes, viz: A, Those in which the descriptions, or specimens preserved in the Army Medical Museum, show either positively or with a reasonable degree of probability that the ulcers were of simple inflammatory or catarrhal origin; on account of the prominent form of ulceration these may be designated simply as *cases of follicular ulceration*. B, Those in which the descriptions are too imperfect to permit the nature of the ulcers to be positively diagnosticated. Undoubtedly in many of these cases the ulcers were of diphtheritic origin, but on account of the uncertainty in which they are involved they will be designated *undetermined cases*.

A. *Cases of follicular ulceration.*—A few of these cases probably belong to acute diarrhœa or acute dysentery. Thus, in case 871 the patient was killed by lightning, and had never been on sick report: Pin-head enlargement of the solitary follicles of the ileum and minute follicular ulcers of the colon were found after death; but if, as is possible, diarrhœa previously existed, it was not probably severe or of long duration. In case 402 the patient was only sick about fifteen days. His disease is reported as acute gastro-enteritis. His stomach was so irritable that little could be retained, and considerable griping attended the stools; but there does not appear to have been any tenesmus. The large intestine was

found thickly studded with small ulcers, very few of which exceeded a pin's head in size. In case 855 the disease was acute catarrhal dysentery, as is quite clearly shown by the history. The patient died after an illness of but sixteen days. The attack began as diarrhœa, but assumed the dysenteric characters on the fourth day. The stools were mucous and bloody, at first very frequent, and there was great tenesmus. On the autopsy, evidences of intense catarrhal inflammation were observed throughout the intestines, especially in the lower part of the ileum and in the large intestine; in the rectum follicular ulceration was just commencing. Case 839 was possibly of the same nature, being recorded as acute dysentery, but the clinical history is too imperfect to warrant a judgment.

In the great majority of cases belonging to this class, however, the history is either unmistakably that of a chronic flux of from two to more months' duration, or, although the clinical history is imperfect, the length of treatment in the last hospital only being recorded, the cases are reported as "chronic diarrhœa" or "chronic dysentery." It is possible that some of these also may really have been acute cases, but I cannot regard this as very probable. In eleven of these cases, viz: 248, 329, 343, 378, 421, 451, 468, 490, 545, 569 and 826, more or less marked evidences of chronic catarrhal inflammation of both small and large intestines, such as has been described in a previous portion of this section,* were found, but ulceration had taken place in the small intestine only. In all these cases the descriptions are sufficiently clear to make it very probable, and in most of them to make it certain, that the ulceration was of catarrhal, generally of follicular, nature, similar to that which often occurs in the small intestine when there is follicular ulceration of the colon. Case 332 probably also belongs to this group.† I feel by no means sure that the colon was entirely free from ulcers in all these cases; the bias in the minds of certain medical officers leading them to seek the lesions of "chronic diarrhœa" as well as of the acute form of the disease in the small intestine,‡ must not be forgotten. Nevertheless I do not doubt that in chronic intestinal catarrh the small intestine sometimes ulcerates before the large, though this happens comparatively seldom.

But in most of these cases of follicular ulceration the process was either exclusively or chiefly seated in the large intestine. I find ninety-nine autopsies of this kind, which may be divided into two groups, the first embracing those in which the intestine was affected merely by simple chronic inflammation with the follicular and other ulcers dependent upon it; the second those in which, at some time during the disease, usually just before death, diphtheritic inflammation of the mucous membrane between the ulcers had supervened. To the first group belong fifty-nine autopsies, viz: cases 86, 134, 138, 139, 140, 142, 145, 166, 194, 195, 196, 198, 201, 207, 208, 223, 225, 234, 263, 264, 267, 281, 293, 295, 301, 310, 320, 339, 350, 351, 355, 363, 370, 374, 381, 387, 389, 401, 414, 426, 458, 461, 505, 518, 561, 575, 598, 645, 687, 697, 714, 715, 732, 746, 819, 823, 844, 860 and 873. To the second group belong forty autopsies, viz: cases 167, 191, 227, 262, 265, 266, 277, 300, 314, 316, 318, 333, 336, 368, 371, 379, 395, 398, 427, 428, 431, 432, 451,§ 500, 542, 543, 573, 574, 801, 814, 853, 856, 858, 859, 868, 869, 870, 872, 877 and 878.

* Page 296, *supra*.

† In case 332 the soldier died of pneumonia. He had previously suffered from what was diagnosticated typhoid fever; the typhoid lesion, however, was not found in the small intestine, but only "ulcerations in the transverse rugæ of the jejunum;" all that is said of the colon is that it was "contracted." Whether the case was simply one of intestinal catarrh or one of continued fever (not typhoid) must remain uncertain. To the cases enumerated above I might also add case 342, see note to p. 310, *supra*.

‡ Page 266, *supra*.

§ Case 451 was reported as one of "cholera morbus." From the autopsy, I presume it to have been a case in which the diphtheritic process supervened comparatively early in the course of a chronic flux, (*i. e.*, before much emaciation had occurred,) and suppose the vomiting, which often accompanies such cases, to have led to the diagnosis recorded.

*Heliotype.* *James R. Osgood & Co., Boston*

COLON WITH FOLLICULAR ULCERS AND PATCHES OF PSEUDO MEMBRANE.

No. 279. MEDICAL SECTION.

These two groups are to be regarded as really constituting but a single morbid category, the second group differing from the first less in the essential nature of the cases than in their mode of termination. A number of the cases in each group are imperfectly observed and recorded, but others are given with satisfactory detail and fairly represent the morbid conditions present. As of the latter character, eight cases recorded by Dr. J. Leidy, eleven by Assistant Surgeon McGill, ten by Assistant Surgeon Allen and four by Surgeon French, may be particularly commended. Moreover, specimens from fourteen cases of the first group and thirty-three of the second are preserved in the Army Medical Museum; [the Museum numbers are in each instance attached to the account of the case in the previous sections.] These specimens, taken in connection with those described and figured above, furnish tolerably complete material for the study of the lesions under consideration, which has been used in drawing up the general account of these lesions already presented.* It only remains to make a few brief additional comments with regard to the cases just enumerated.

In these cases the *large intestine* presented all the phases of follicular ulceration, thickening of the submucosa and changes of color, which have already been sufficiently dwelt upon. In some of them those solitary follicles which were not ulcerated are spoken of as enlarged, or the seat of pigment deposits, or both. In others the coats of the intestine are described as softened or hardened, gelatinous, lardaceous, &c. In some of the cases the ulcers in the large intestine were few in number or slight in character, indicating that the ulcerative process had just commenced, as in cases 138, 140, 142 and 145, which are examples of the so-called Chickahominy diarrhœa, and differed from the non-ulcerative cases of the same group already described† only in the presence of a few incipient follicular ulcers. Cases 86, 293, 339, 363, 645 and 687 are examples of the same condition occurring under other circumstances. Between these cases and those in which the large intestine was riddled with numerous punched-out ulcers, and in which there was great thickening of the submucous connective tissue, every transition existed.

In the cases in which the diphtheritic process had supervened it varied in intensity from a mere pseudomembranous frosting of the affected mucous membrane to deep and extensive diphtheritic sloughing. Cases 300, 316, 870 and 877 are examples of the latter occurrence, which was comparatively rare, probably because when the diphtheritic process attacked the intestine of a patient already exhausted by a chronic flux he usually succumbed before the new lesion had time to make much progress.

Perforation of the colon by the ulcers was observed in but two instances, viz: case 801, in which two perforations occurred in the transverse colon, leading to extravasation of the intestinal contents and fatal peritonitis; and case 872, in which there were several perforations just above the sigmoid flexure. Both of these were cases in which the diphtheritic complication had supervened. No instance has been brought to my notice in which perforation occurred in a case of flux resulting from uncomplicated follicular ulceration.‡ In case 878 an hepatic abscess had opened into the colon. In cases 140 and 401 it is stated that some of the ulcers appeared to be cicatrizing; in cases 293 and 398 that some of them had actually cicatrized; in three other cases, although no mention is made of cicatrices in the reports, well marked ones were found between the unhealed follicular ulcers in the specimens received at the Museum. These were case 196, [Med. Sect. 616,] case 513

* See p. 515 *et seq.*, *supra*. † See p. 310, *supra*.

‡ Of course I do not overlook the occurrence of perforation in typhlitis, which is not embraced in my statement.

[Med. Sect. 673] and case 872, [Med. Sect. 971.] Similar cicatrices are shown in No. 466, Medical Section, from a case related in Circular No. 6.* With regard to the characters of the cicatrices of follicular ulcers see the account given on page 519.

In a few of the cases under consideration, viz: cases 167, 196, 263, 314, 316, 368, 500, 732 and 877, the mucous membrane of the *small intestine* is stated to have been healthy; in case 379, it is recorded that the small intestine was healthy, except that its walls were thin; in case 878 an abscess of the liver opened into the duodenum, but the small intestine is said to have been otherwise healthy; in cases 543 and 687 no lesion of importance was observed except in the large intestine; and in fifteen cases no mention is made of the condition of the small intestine. In all the other cases, seventy-one in number, congestion of the mucous membrane, enlargement of the solitary follicles, hypertrophy of the villi, thickening or softening of the mucous membrane or other evidences of inflammation are recorded as having been observed in the small intestine.

In several cases this condition was associated with more or less ulceration quite similar to that described above as sometimes existing in the small intestine only. Thus, in cases 201, 266, 301 and 414, from one to three small ulcers were observed in the ileum. In case 374 Peyer's patches were slightly elevated, and one of them near the cæcum ulcerated; the solitary glands in the same region were enlarged and slightly ulcerated. In case 401 there were in the last two feet of the ileum several ulcers in process of cicatrization. In case 853 one or two of Peyer's patches were studded with minute ulcers. In these cases the ulcers were undoubtedly catarrhal in their nature, whether follicular or not, and the same was probably the nature of the more numerous ulcers at the lower extremity of the small intestine in cases 195, 208, 262, 363 and 844. In cases 461, 715 and 869 ulcers existed in the small intestine, which, from the descriptions, would appear to be undoubtedly of typhoid origin, and those mentioned in cases 505 and 860 were possibly of the same nature. Peyer's patches are spoken of as thickened or congested in about a dozen other cases, and in about as many pigment deposits were observed in them, in the solitary follicles or in the extremities of the villi. I do not believe that this represents the frequency with which pigment deposits actually occurred in these situations, and think their presence frequently failed to attract attention.

In several of the cases in which the diphtheritic process had supervened between the follicular ulcers in the large intestine, it also extended into the lower portion of the small intestine. This occurred in cases 333, 371 and 801, and a similar condition, associated with ulceration of the small intestine, was observed in cases 277, 431 and 870; case 454, in which the mucous membrane of the ileum for twelve inches from the ileo-cæcal valve was thickened, inflamed, ulcerated and "almost gangrenous in many places," was probably of the same nature.

Assistant Surgeons McGill and Allen in several of their autopsies speak of the small intestine as being thin, extremely thin, or dilated and thin: cases 333, 350, 351, 355 and 381 are examples. In case 387 Assistant Surgeon Allen remarks that the small intestine, which was anæmic, with conspicuous solitary follicles, "had an ironed-out appearance." In case 86 there was an intussusception about eight inches long in the small intestine; in case 505 there were two intussusceptions in the ileum. In case 316 a cul-de-sac projected

* Circular No. 6, S. G. O., Nov. 1, 1865, p. 146. A portion of the ileum of the patient is represented in a chromo plate facing the page cited; he is said to have died of typhoid fever.

from the ileum opposite its mesenteric attachment and sixteen inches above the ileo cæcal valve. In case 398 it is stated that Brunner's glands in the duodenum were enlarged, and in case 869 that the follicles of the duodenum were prominent.

The presence of *gas in the intestinal canal* appears seldom to have attracted attention. In cases 145, 281 and 645 it is stated that the intestines were distended with gas; in case 363 that the intestines, especially the colon, were so distended; in case 131 that the transverse colon was distended with gas; in case 355 that the ileum and cæcum were "dilated;" in case 350 that a small portion of the jejunum was dilated. Of course, the intestines were much more frequently distended than this would indicate, but the circumstance does not appear to have been thought worthy of record.

In many of the cases the condition of the *stomach* is not recorded. It is spoken of as congested or inflamed in about a dozen and a half cases. In a few instances it is said to have been pale or softened. In cases 281, 398, 426 and 870 its mucous membrane is said to have been slightly thickened, or thickened. In cases 301 and 427 it is stated that the walls of the stomach were thin. In case 134 the pyloric half of the stomach was contracted to an inch in diameter, and to a corresponding degree in the cardiac half, [No. 63, Med. Sec.] A similar contraction of the stomach existed in cases 428 and 844. In cases 139, 145, 363 and 645 the stomach was distended with gas.

I note, also, that in seven of the cases included in the foregoing groups, viz: 231, 263, 264, 266, 267, 398 and 870, the diagnosis typhoid fever was recorded at some time during the progress of the case, although the typhoid lesion was not found after death in the glands of Peyer; also that some form of malarial fever is said to have preceded the flux or occurred during its progress in eleven cases, viz: intermittent fever in cases 191, 191, 195, 316, 389, 401 and 859; remittent fever in cases 167 and 320; typhoid remittent fever in case 363; and typho-malarial fever in case 518. I must think that had all the cases been recorded with completeness, these complications would have been found of still more frequent occurrence.

B. *Undetermined cases.*—I have included under this heading all those cases in which the language used in the reports implies that a large part of the mucous membrane of the large intestine was destroyed by ulceration, such as those in which it "presented numerous large ulcers," was "extensively ulcerated," "a mass of ulceration," "much ulcerated throughout," &c., &c., as well as those in which it is simply recorded that the intestine was "ulcerated," without defining the extent of the ulcers any better than their other characters. Cases of the first kind undoubtedly very often represent the large ulcers left after the separation of diphtheritic sloughs, while those of the second very often represent follicular ulcers. But the cases here included are so imperfectly recorded, both as to their clinical history and the post mortem appearances, that it would hardly be safe to affirm positively of any one of them to which of these two categories it properly belongs.

I find altogether two hundred and ninety-three cases of this character, viz: cases 78, 79, 80, 83, 84, 85, 87, 88, 89, 90, 91, 96, 99, 100, 101, 106, 108, 112, 117, 119, 120, 122, 123, 178, 183, 186, 189, 193, 211, 213, 214, 219, 220, 228, 229, 231, 233, 237, 240, 247, 249, 250, 254, 255, 258, 260, 261, 268, 269, 272, 273, 274, 275, 276, 279, 283, 285, 289, 290, 292, 296, 297, 298, 301, 307, 308, 311, 312, 319, 322, 326, 327, 331, 356, 365, 375, 380, 383, 384, 388, 391, 393, 394, 396, 405, 406, 407, 408, 409, 410, 411, 417, 418 420, 422, 423, 440, 441, 443, 447, 448, 449, 450, 452, 453, 456, 457, 459, 461, 469, 471,

486, 487, 501, 504, 506, 507, 509, 510, 511, 513, 519, 520, 521, 522, 523, 526, 527, 528, 533, 536, 541, 549, 550, 552, 555, 557, 559, 563, 565, 568, 571, 572, 576, 577, 578, 580, 588, 593, 601, 602, 604, 607, 609, 610, 614, 615, 617, 618, 619, 620, 621, 622, 623, 624, 626, 629, 631, 632, 634, 636, 637, 638, 640, 641, 643, 646, 647, 648, 649, 650, 651, 653, 654, 655, 656, 658, 659, 660, 661, 662, 663, 665, 670, 671, 673, 674, 675, 676, 678, 680, 681, 686, 688, 691, 695, 696, 698, 700, 703, 704, 705, 706, 707, 708, 709, 713, 717, 718, 719, 720, 721, 722, 724, 726, 727, 728, 731, 733, 734, 735, 736, 737, 738, 739, 741, 742, 743, 744, 745, 747, 753, 754, 755, 756, 757, 758, 759, 762, 764, 765, 766, 767, 768, 771, 772, 773, 775, 777, 778, 781, 782, 786, 787, 791, 792, 794, 802, 803, 804, 806, 807, 808, 810, 812, 813, 815, 820, 825, 828, 830, 833, 834, 835, 840, 842, 843, 846, 847, 848, 849, 850 and 851.

In most of these cases the duration of the disease is not reported with precision; but in eighty-four of them, chiefly recorded as chronic diarrhœa or dysentery, the record extends over a period ranging between two months and two years or even longer. In the remaining cases, in which the duration of treatment in the hospital where the patient died was less than two months, and the previous duration of the disease quite unknown, the same diagnosis is generally recorded. There are, however, a few exceptions. Thus, cases 193 and 440 are recorded "diarrhœa," and case 213 "dysentery," without specifying whether acute or chronic. Cases 423, 507 and 522 are recorded "acute diarrhœa," and case 835 "enteritis." In eight cases the intercurrent disease, which was the immediate cause of death, only is recorded, viz: cases 656 and 722, "acute bronchitis;" case 840, "pleurisy;" cases 620, 624 and 631, "typhoid pneumonia;" and cases 405 and 673, "pleuropneumonia." In cases 501, 510, 513, 536 and 834 the disease was diagnosticated "typhoid fever;" in case 825, "typhoid remittent fever;" and in case 411, "remittent fever." In case 279 no diagnosis is recorded. In case 406 the diagnosis recorded is rheumatism and phthisis, but no tubercular disease of the lungs was found on the autopsy. In case 521 the diagnosis recorded is consumption, and on the autopsy tubercular disease of the lung was actually found. In case 409 the patient had a gunshot wound of the left hand, and is said to have died of "purpura and exhaustion." Notwithstanding these diversities of diagnosis, I presume the majority of the cases specified were actually examples of chronic dysentery; that some of them may have really been men admitted in the later stages of acute diphtheritic dysentery I do not doubt, but the same remark applies also to those cases in the foregoing list in which the diagnosis chronic diarrhœa or dysentery was recorded.

From several of these cases specimens were sent to the Army Medical Museum, but only in four instances is any portion of the alimentary canal represented, and in these the specimens do not suffice to solve the doubt with regard to the nature of the disease. The cases in question are 193, 440, 578 and 721. In case 193 the specimen [No. 618, Medical Section] is a small portion of the cæcum, with the ileo-cæcal valve and two inches of the ileum. There are several ulcers in the cæcum, one of which has perforated. From the characters of these ulcers I incline to the opinion that they are of diphtheritic origin; but the rest of the colon not having been sent to the Museum, and the descriptions being imperfect, I am uncertain whether the case was one of acute diphtheritic dysentery or whether the diphtheritic process supervened upon a chronic flux. In case 440 the specimen [No. 44, Medical Section] is a portion of the jejunum showing an invagination. In case 578 the specimen [No. 478, Medical Section] is a portion of the greater curvature of the

*Heliotype.* *James F. [illegible] & Co., Boston*

COLON WITH IRREGULAR ULCERS.

No. 135. MEDICAL SECTION.

stomach, showing a number of minute ulcers. In case 721 the specimen [No. 53, Medical Section] is a pedunculated connective-tissue tumor attached to the peritoneal surface of a small fragment of the ileum.

In very many of these cases the *large intestine* is spoken of as thickened, softened, congested or inflamed. In all of them ulceration is affirmed to have existed except five, in which it may reasonably be inferred to have been present from the language used, viz: in case 255 "the mucous membrane of the intestines was extensively disorganized;" in case 471 the mucous membrane of the colon was "very much disorganized;" in case 611 the mucous membrane of the colon was "disorganized by inflammation;" in case 88 the mucous membrane of the intestines, especially of the large intestine and rectum, was "very much diseased;" and in case 394 the intestines presented "the usual lesions of chronic diarrhœa." In a few instances, viz: cases 83, 89, 250, 459, 626, 781, 782, 786 and 787, besides the fact of ulceration, the ulcers themselves or other parts of the mucous membrane of the large intestine are spoken of as "gangrenous," or "almost gangrenous," or as having a "gangrenous appearance;" epithets no doubt suggested by some of the phases of the diphtheritic process.

Besides case 557, in which it is left uncertain whether the perforations recorded existed in the small intestine or the large, the large intestine is said to have been *perforated* in nine instances, viz: case 193, a perforation in the cæcum; case 559 one perforation, and case 213 two, in the ascending colon; case 211 one perforation, and case 728 several, in the transverse colon; case 269, numerous perforations in the descending colon; cases 296 and 419, each a perforation in the sigmoid flexure; and in case 327 one just below the sigmoid flexure. In the first of these cases [193] fæcal extravasation was prevented by previous adhesions, and the perforation communicated with a circumscribed abscess containing about two ounces of offensive pus, which burrowed between the iliacus internus and psoas magnus muscles; in cases 211, 296, 327, 449 and 557 evidences of fæcal extravasation or of more or less extensive peritonitis were observed; in the remaining cases no mention is made of these consequences, and I am therefore disposed to regard them with some reserve, since undoubtedly the rents made during the unskilful removal of extensively ulcerated dysenteric intestines are occasionally mistaken for perforations.

Some of the ulcers were thought to be healing in cases 247, 268, 272, 273, 731, 772, 810 and 813. Fully formed cicatrices, or what were supposed to be such, were observed between the still open ulcers in cases 79, 308, 522, 528, 602 and 847; only in the first and last of these cases is any description given of the character of these cicatrices; in case 79 the flux appears to have been kept up by rectal ulcers the exact nature of which remains uncertain; "between them were puckered cicatrices of various dimensions, the largest the size of a five-cent piece;" in case 847 some of the ulcers in the rectum "had cicatrized, in consequence of which the calibre of the gut was diminished." To these may be added case 585, which was not included in the list under discussion, because the patient appears to have recovered from the flux some time before death. He was admitted to hospital suffering with jaundice, and died of peritonitis complicated with pleurisy of the right side, which set in a few weeks before death. He does not appear to have had diarrhœa during the six weeks he was in hospital except for a few days from taking cod-liver oil. "Traces of former ulcers" were found in the sigmoid flexure and transverse colon.

In sixty-one of the cases included in this class the condition of the *small intestine* is not recorded. In twenty-eight cases it is said to have been healthy. In almost all the others

the small intestine, or some part of it, is spoken of as congested, inflamed, thickened, softened, abraded or ulcerated. Ulceration of the small intestine is recorded in seventy-five cases, in nine of which Peyer's patches are said to have been ulcerated, viz: 240, 308, 311, 365, 456, 559, 709, 743 and 777. Most of these were probably complications with the typhoid process. In case 456 the ulcers are said to have been healing. In about half a dozen other cases Peyer's patches are said to have been thickened; in case 356 they are said to have presented a mammillated appearance. *Perforation* of the small intestine is said to have existed in case 237.. According to the record, the solitary glands throughout the ileum were ulcerated, and it was one of these ulcers which had perforated; fæcal extravasation and general peritonitis resulted. In case 557 it is stated that "there were a number of perforations," but the record does not make it clear whether they were in the ileum or large intestine, both of which are said to have been "extensively ulcerated."

In two cases *cicatrices* were observed in the small intestine, viz: case 88, in which the cicatrices are said to have been "numerous," and case 231, in which simply "some cicatrices" were observed; whether these cicatrices corresponded in position to Peyer's patches or not does not appear from the record. A single *intussusception* of the small intestine was observed in cases 78, 84, 99, 269, 580, 623, 636, 660, 665, 680 and 686; two intussusceptions in cases 440, 671 and 673; three in cases 521 and 658; four in case 602, and seven in case 618. These probably all occurred shortly before death, or during the agony, as in none of them did any inflammatory condition about the seat of the invagination attract attention, except perhaps in case 78, in which it is recorded that the bowel adjoining the invagination was greatly congested. In case 418 a *diverticulum* two inches long and half an inch in diameter was found five feet and a half above the ileo-cæcal valve. In case 708 a similar diverticulum about two inches long and of nearly the same diameter as the ileum was found about twelve inches above the ileo-cæcal valve.

In very many of these autopsies the condition of the *stomach* is not mentioned. In about forty cases it is spoken of as congested, inflamed or thickened; in case 786 it is said to have presented "many excoriations;" in cases 78 and 258 it was "ulcerated;" in case 807, ulcerated at the pyloric extremity; in case 247 there were two ulcers near the pylorus, and one of considerable extent in the greater curvature; several other ulcers had existed, but were healed. In case 578 the mucous membrane presented a number of minute ulcers. A portion of this stomach has been preserved in the Museum, [No. 478, Medical Section.] The ulcers are quite numerous, very small, and resemble the minute follicular ulcers of the colon seen in certain cases of chronic dysentery.

These conditions represent the various stages of catarrhal inflammation of the gastric mucous membrane, which, it would appear, were observed in somewhat more than one-sixth of all the undetermined cases. Similar conditions were observed in nearly one-fourth of the cases of follicular ulceration;* in about one-sixth of the cases of acute diphtheritic dysentery;† and in about one-fourth of the cases in which the intestinal mucous membrane was inflamed without being ulcerated.‡ It would not be safe to infer that gastric catarrh is a more frequent complication of catarrhal than of diphtheritic dysentery from these figures, because there are so many cases in which the stomach was not examined, or in which its appearances are not recorded. Nor should I be willing, in view of the inexperience of many of those who made the autopsies under discussion, to admit that gastric

* *Supra*, p. 525. † *Supra*, p. 456. ‡ *Supra*, p. 314.

*Heliotype.* *James R. Osgood & Co., Boston.*

COLON, WITH CICATRICES OF FOLLICULAR ULCERS.

No. 603. MEDICAL SECTION.

[ENLARGED ONE-HALF.]

catarrh had actually existed in every one of those instances in which the stomach is spoken of as congested or inflamed; but after making every allowance for errors of this sort, the figures will, I think, serve to show, in spite of their incompleteness, that gastric catarrh is a very frequent concomitant of all the varieties of intestinal flux.* In case 791 we are told that "on opening the stomach, a firm tumor, the size of a hazel-nut, with a central opening, from which pus flowed, was seen near the pylorus."

The presence of *gas in the alimentary canal* is referred to in but few instances. In cases 258, 272, 296, 624, 632, 634 and 777 the stomach was distended with gas; in cases 255 and 735 the stomach and intestines; in cases 456, 676 and 759 the intestines; in case 808 the small intestine; in case 577 the ascending and transverse colon; in case 659 "the small intestine was a succession of abnormally large pouches alternating with constrictions."

LESIONS OBSERVED IN OTHER ORGANS.—In this place the lesions observed in other organs, in both the cases of follicular ulceration and in the undetermined cases, will be discussed.† In the majority of the cases of both classes in which the appearance of the body at the time of the autopsy is recorded it is spoken of as emaciated, much emaciated or extremely emaciated. In a few cases of each class the emaciation is said to have been slight; and in one only of the cases of follicular ulceration, viz: 454, and two of the undetermined cases, viz: 407 and 408, the body is said to have been stout, well nourished or well supplied with fat.

Besides the characteristic posterior suggillation, mentioned in a number of the autopsies, discolored spots, resembling ecchymoses or the spots of purpura, were observed on the anterior parts of the trunk and abdomen in a few instances. These are mentioned in six of the cases of follicular ulceration, viz: cases 134, 138, 139, 140, 142 and 310—all except the last recorded by Dr. J. Leidy; and in seven of the undetermined cases, viz: cases 406, 409, 471, 638, 640, 681 and 778. I doubt not similar conditions existed in other cases, although not recorded, apparently because little importance was attached to this circumstance by most of those by whom the post mortem examinations were made. Such purpura-like stains may originate in several ways: They may result from some undefined alteration of the blood, such as exists in purpura; they may express a febrile condition analogous to that which exists in typhus or typhoid fevers, or they may be the consequence of scurvy. The latter condition was actually recognized in a few of the cases just enumerated. Thus, in

* I know of no trustworthy statistical appreciation of the frequency of gastric complications in dysentery. ANNESLEY—*Diseases of India*, London, 1828, Vol. II, p. 271—thought they occurred only in "the cases of dysentery occurring during the progress of, or upon convalescence from, fevers," and even then regarded them as merely contingent affections. On the other hand, HAUFF—*Zur Lehre von der Ruhr*, Tubingen, 1836, S. 318 *et. seq.*—on the basis of the dissections of the Wurtemberg physicians during the epidemic of 1834, regarded gastric inflammation as a part of the dysenteric process, which involved the whole length of the alimentary canal from the stomach to the anus, most intense, indeed, in its lower portion, but not sparing the rest. He describes redness, thickening, pseudomembranes and even ulceration as usual appearances in the gastric mucous membrane. PARKES—*Dysentery and Hepatitis of India*, London, 1846, p. 49—declared, on the basis of his own dissections, that "in all cases of simple dysentery the alterations in the canal are circumscribed by the ileo-colic valve;" but admitted that "gastro-enteritis is at certain times an accompaniment of dysentery, and is a dangerous complication, on account of the obstinate exhausting vomiting which may attend it." FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift, Bd. IV, 1849, S. 140, and GRIESINGER—*Krankheiten von Egypten*, Abschnitt X, Cap. 2, Vierordt's Archiv für Phys. Heilk., Bd. XIII, 1854, S. 539—both observed gastric catarrh in a small number of their cases, erosions or ulcerations of the mucous membrane of the stomach still more rarely. GRIESINGER observed hæmorrhagic erosions even more frequently than catarrh. MACPHERSON—*Bengal Dysentery*, Calcutta, 1859, pp. 34 and 41—in 100 dissections of acute dysentery, found the mucous membrane of the stomach over-vascular or softened in 4 cases, and ulcerated in 1. In 55 dissections of chronic dysentery the gastric mucous membrane showed chronic inflammation and softening in 2 cases, increased vascularity in 2, and abrasion of the pylorus in 3. MOREHEAD—*Disease in India*, London, 1860, p. 271—reports two cases in which circular ulcers of the stomach were associated with similar ulcers in the colon, but does not discuss the question of the frequency of gastric catarrh in dysentery. JULIEN—*La dysenterie en Cochinchine* Montpellier Thesis, No. 62, 1864, p. 49—from the study of 108 autopsies of Cochin China dysentery, came to the conclusion that the lesions of the stomach were as rare as unimportant. HEUBNER—*Dysenterie*, in Ziemssen's Handb., Bd. II, Th. 1, Leipsic, 1874, S. 527—declares in a general way that in dysentery the stomach, duodenum and upper part of the small intestine are either normal or in a condition of catarrh, which is especially frequent in tropical dysentery. For the latter statement I know no authority.

† The remarks which follow are based upon an analysis of 395 cases, viz: 103 of follicular ulceration, including cases 901 to 904 and the 99 cases enumerated on p. 522, as well as 293 undetermined cases enumerated on pp. 525 and 526.

case 640 "the lower limbs were œdematous and discolored, the gums in a sloughing condition;" in case 681 "scorbutic stains were observed on both lower extremities;" and the same condition, in a higher degree probably, existed in case 638, in which it is recorded that "the inner side of the left leg, from the thigh to the ankle, was purplish, and on being cut into the tissue beneath the discolored portion appeared to be disorganized."

In three of the cases of follicular ulceration, viz: 167, 281 and 310, the lower extremities were œdematous; the same condition was observed in six of the undetermined cases, viz: 100, 319, 610, 640, 738 and 786; in a seventh case, 365, œdema of the lower extremities coexisted with abdominal distension, and in two other cases, 621 and 735, with general anasarca. In one of the cases of follicular ulceration, case 310, an abscess formed over the left parotid gland a little more than a month before death, followed by a number of subcutaneous abscesses in various parts of the body.

The following anomalies were observed in some of the undetermined cases: In case 250 the skin had a brownish tint; in case 815 the whole surface of the body was of a dark lead color, the result of the excessive use of nitrate of silver; in case 326 there was a large abscess in the anterior portion of the left thigh; in case 680 suppuration of the cervical lymphatic glands had occurred on the right side; in case 681 a small abscess and several ulcers were observed over the left knee; in case 555 there was double inguinal hernia; in case 842 an anomalous condition of the generative organs was observed; and in case 593 there was a general transposition of the thoracic and abdominal viscera from left to right. In case 601 the existence of bed-sores is recorded; this accident must certainly have existed in some of the other cases, but it seems to have been regarded as undeserving mention.

*The brain and its membranes.*—In a considerable number of the cases of both classes the condition of these parts was not recorded. In a few instances the membranes or the brain substance, or both, are said to have been congested, and in a few the brain substance is said to have been soft or flaccid. In a small number of cases congestion of the brain or its membranes was accompanied by an abnormal quantity of fluid in the subarachnoid space or the ventricles. Thus, among the cases of follicular ulceration, in case 198 there was a considerable quantity of fluid in the subarachnoid space and in the ventricles of the brain, and numerous puncta vasculosa were observed on section of the cerebrum; in case 201 "the substance of the brain was soft; a quantity of reddish fluid was found in the left lateral ventricle; in the left choroid plexus, about an inch from the foramen of Monro, was a mass of white, granular, caseous material resembling tubercle;" in case 223 about four ounces of liquid were found in the lateral ventricles, the floor and roof of which are said to have been "soft and pultaceous;" in case 350 the brain substance was injected with blood and the ventricles full of serum; in case 870 the membranes of the brain were congested, and on removing it about three ounces of pinkish serum were found in the posterior fossæ of the cranium.

So, among the undetermined cases, in case 417 the meninges were opaque, and there was a much larger quantity of subarachnoid fluid than normal; in case 255 the membranes were congested, and from four to six ounces of serum were found at the base of the brain and in the ventricles, [this was one of the cases of sudden death referred to on page 502;] in case 411 the membranes were congested, the brain substance softened, six ounces of fluid escaped on opening the membranes, and two ounces were found in each ventricle; the patient is said to have died of "tetanus from internal irritation;" in case 820 there was a large quantity of serum beneath the arachnoid, and one or two small patches of organized

lymph on the superior surface of the cerebrum. These results do not differ materially from those found in the autopsies of the cases in which the intestines were inflamed but not ulcerated,* or those of acute diphtheritic dysentery.† In each group meningeal congestion and serous subarachnoid or ventricular effusion were found in a small number of instances. No notion of the comparative frequency of these lesions can be formed from the record, because an examination of the cranial cavity was so often omitted. I suspect, however, that in a portion of the cases in which they were observed the normal cerebro-spinal fluid, stained by post mortem transudation of the coloring matter of the blood, has been mistaken for a pathological appearance; moreover, variations in the quantity of blood found after death in the veins of the brain and its membranes are by no means certain indications of morbid conditions existing during life. Still less importance can be attached to the statement that the brain is softened, except when made by an expert, for softening is an early post mortem change in the normal brain. But these considerations will not, I think, dispose of all the observations in question, some of which seem to indicate without doubt that subarachnoid effusion, with or without meningeal congestion, is an occasional complication of all the forms of intestinal flux, and that even, though in rare instances, meningeal inflammation may be developed.‡ To the foregoing I may add that calcareous matter in the pineal gland was noticed in cases 351 and 870; in case 356 the pineal gland is said to have been absent; in case 196 the middle commissure of the brain was absent.

*Respiratory organs.*—These were almost always examined, and were frequently the seat of serious lesions.

The *larynx* was seriously diseased in three of the undetermined cases, viz: in case 120 it was œdematous; in case 522 the immediate cause of death was throat diphtheria extending into the larynx, trachea and bronchial tubes; in case 409 an ulcer in the larynx had exposed the surface of the hyoid bone, which was roughened as if carious.

*Bronchitis*, unconnected with tubercular disease or pneumonia, appears to have been present in two of the cases of follicular ulceration, viz: 363 and 819, and in sixteen of the undetermined cases, viz: 123, 240, 255, 304, 356, 406, 407, 408, 409, 418, 526, 757, 759, 773, 775 and 803. Perhaps the same condition was also present, though not recognized, in some of the cases in which the lungs are said to have been merely congested, for the bronchial tubes were by no means systematically examined in these autopsies.

*Congestion*, occasionally limited to one lung, but usually involving both, was the only pulmonary lesion recognized in about a dozen of the cases of follicular ulceration, and about half as many more of the undetermined cases. In several of these cases the congestion is said to have been hypostatic, and it was probably of the same character in some of the others; in a few it may have represented incipient pneumonia.

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* Page 314, *supra*. † Page 457, *supra*.

‡ These complications, in consequence of their rarity, have escaped the consideration of most of the writers on dysentery, who have either passed them over or, like JULIEN—*La dyssenterie en Cochinchine*, Montpellier Thesis, No. 62, 1864, p. 23—declared them to be of little importance. They particularly attracted the attention of the Wurtemberg physicians during the epidemic of 1834. According to G. C. P. HAUFF—*Zur Lehre von der Ruhr*. Tubingen, 1836, S. 314—during that epidemic HEIM found subarachnoid effusions in 22 out of 25 post mortem examinations; SPÄTH in 17 out of 20, and RAMPOLD in 4 out of 5. The effusion consisted in most cases of clear or bloody serum, but sometimes was gelatinous, (i. e., contained coagulated fibrin,) and sometimes even the convolutions were coated with pseudomembranes. Similar effusions were found in the ventricles of the brain, and in two instances in the spinal canal. The substance of the brain was softened and rich in blood. These lesions were found in the bodies even of those who remained conscious to the last. These statements are undoubtedly open to the criticism made in the text on our own autopsies. HEUBNER—S. 528, *op. cit.*, *supra*, p. 529—takes a very similar view, saying that the Wurtemberg physicians were misled by false interpretation of "œdema of the subarachnoid lymph spaces." VOGT—*Monographie der Ruhr*, Giessen, 1856, S. 66—in speaking of the Wurtemberg observations, declared that in numerous autopsies in his own practice he had met these lesions but rarely except in those cases in which brain symptoms had been present during life. LYONS—*Report on the Pathology of the Diseases of the Army in the East*, London, 1856, p. 50—appears to have observed similar lesions, but gives no precise data as to their frequency: "In the Arachnoid, the changes have been confined to opacity, associated with fluid effusion over the convolutions and in the ventricles of the Brain. Congestion of the Pia Mater has been also observed to a morbid degree."

*Pneumonia* was a very frequent complication, and often proved the immediate cause of death. Not including those cases in which the disease supervened upon tubercles of the lungs, pneumonia or pleuropneumonia of one or both lungs was observed in rather more than one-fifth of all the autopsies. Thus, among the cases of follicular ulceration eighteen instances of pneumonic complication were observed. In four cases the lung lesion is described as lobular pneumonia, affecting the right lung in case 140, the left in case 167, both lungs in cases 339 and 351. In twelve cases the lesion is either described as red or gray hepatization, or simply as pneumonia, or hepatization, or inflammation, affecting the right lung in cases 86, 227, 389, 395 and 505; the left lung in cases 198, 265, 387 and 746; both lungs in cases 458, 732 and 858. Pleuropneumonia was observed on the right side, with pneumonia on the left, in cases 414 and 714.

Among the undetermined cases sixty-four instances of pneumonic complication were observed. In six cases the lesion is described as lobular pneumonia, affecting the left lung in cases 297 and 393; both lungs in cases 229, 705, 758 and 765. In forty-five cases it is described either as red or gray hepatization, hepatization, pneumonia or inflammation; affecting the right lung in cases 254, 283, 319, 384, 388, 391, 447, 448, 449, 527, 614, 618, 626, 631, 655, 656, 658, 698, 733, 735, 737, 738, 739, 755, 762, 791 and 792; the left lung in cases 84, 292, 453, 456, 601, 671, 736, 767, 804 and 834; both lungs in cases 193, 311, 604, 742, 745, 747, 768 and 813. Pleuropneumonia was observed in thirteen cases: on the right side in cases 405, 507, 673 and 678; on the left side in cases 509, 654, 681 and 753; on both sides in cases 420, 504, 649, 653 and 661. There are, besides, in each class several cases in which either no disease of the lung tissue is specified, or it is merely said to have been congested, but in which the recorded weight of one or both lungs is so great as to create a suspicion of the existence of pneumonia, so that it is highly probable that the frequency of this complication was even greater than would be indicated by a literal interpretation of the record.

The time of year at which these pneumonic cases died points significantly to the probable causes of the chest affection. I find that of the eighty-two instances of pneumonic complication mentioned above, sixty-nine died between the first of October and the last of March, and but thirteen between the first of April and the last of September.* A similar observation may be made with regard to the pneumonic complications observed in the other forms of flux discussed in previous portions of this chapter. Of forty-two such cases occurring in connection with non-ulcerative inflammation of the intestinal mucous membrane, twenty-seven died between the first of October and the last of March, and fifteen during the rest of the year;† and of twenty occurring in connection with acute diphtheritic dysentery, eighteen died between the first of October and the last of March, and but two during the rest of the year.‡

A comparison of these figures with the number of autopsies of each of the several forms of flux shows that pneumonia was observed rather more frequently than once in every four autopsies in which non-ulcerative inflammation of the intestine was found; rather less frequently than once in every five autopsies of acute diphtheritic dysentery; somewhat oftener than once in every six autopsies of chronic follicular ulceration, and once

* Viz: April, 2; May, 3; July, 2; August, 3; September, 3: total, 13. October, 4; November, 11; December, 14; January, 22; February, 12; March, 6: total, 69.

† Viz April 2; May, 6; July, 1; August, 3; September, 3: total, 15. October, 6; November, 3; December, 7; January, 2; February, 5 March, 4: total, 27.

‡ Viz: May, 1; September, 1: total, 2. October, 3; November, 3; December, 2; January, 1; February, 4; March, 5: total, 18.

in every four of the undetermined cases.* It will be observed that the difference in the frequency of pneumonic complications in the several groups of cases was not very great; and the fact that they were quite as common in the non-ulcerative cases as in the diphtheritic or ulcerative ones, confirms the view that their development was not dependent upon the character of the intestinal lesion.

The occurrence of *metastatic foci* in the lungs† does not appear to have been recognized in any of the autopsies. I note, however, among the cases of follicular ulceration three in which this lesion probably existed, viz: in case 139, "isolated nodular masses of effused blood about the size of shell-barks, some of which had a white central nucleus," were found in both lungs; in case 195 both lungs contained a number of small abscesses, there being also an abscess of the liver in this case; and in case 333 the right lung contained a number of "circumscribed condensations of tissue" which presented "the features of red and gray hepatization," and varied in size from that of a pea to that of a large walnut, a similar nodule being also found in the left lung. Among the undetermined cases there are at least two which probably require the same interpretation, viz: case 247, in which numerous small abscesses were found in both lungs; and case 787, in which circumscribed elevated spots, hard at their peripheries, soft in their centres, were observed on the surfaces of both lungs. Here too probably belongs case 393, mentioned above as one of lobular pneumonia; the lobules are said to have been hepatized gray.

To the foregoing I may add that the pneumonic process in case 460, mentioned on page 315, was probably of the same nature; "several of the lobules in all the lobes" of the right lung "were hepatized, some of them having advanced to the stage of gray hepatization;" in this case "no ulcers could be detected in the ileum," but there were one or two "abraded" spots in the cæcum. It has also been mentioned on page 457 that in case 160, one of the diphtheritic cases, a multitude of purulent foci were found in the lower part of the superior lobe of the left lung. These are the only autopsies I find among those hitherto recorded in which I feel warranted in interpreting the appearances observed as resulting from embolic pneumonia.‡ Possibly some few more of the cases recorded as lobular pneumonia were of the same nature, but I suspect that many of these were really examples of lobular collapse occurring during bronchitis, and not pneumonia at all.

*Pleurisy* or pleuritic effusion, uncomplicated with tubercular deposits or pneumonia, was observed in thirteen instances. Among the cases of follicular ulceration, in case 196 both pleural sacs contained "much serum;" in case 263 the right lung was compressed by two quarts of pus, and the pleura costalis was coated with pseudomembrane; in case 363 the pleural sacs contained six and three-quarter ounces of bloody serum; in case 426 the right pleural sac was about half-full of fluid; in case 697 it contained a large quantity of serum; in case 398 the left pleural sac contained two ounces of bloody serum; in case 645 "there were evidences of pleurisy on the left side;" in case 819 the right pleural sac contained sixteen ounces of serum, the left eight, and the surfaces of both lungs were coated with "unorganized lymph," bronchitis also existing in this case; in case 902 a hepatic abscess had discharged into the right pleural sac. Among the undetermined cases, in case 89 "evidences of recent pleurisy" were observed on both sides; in case 120 the thoracic

* The figures are as follows: Of 156 autopsies of non-ulcerative intestinal inflammation, (see note † to p. 314, *supra*,) pneumonic complications were recorded in 42, (see p. 315;) of 115 autopsies of diphtheritic dysentery, (see note to p. 456, *supra*,) they were recorded in 20, (see p. 457, *supra*;) of 103 autopsies of follicular ulceration, (see note † to p. 529, *supra*,) in 18; and of 293 undetermined cases, (see p. 525, *supra*,) in 64.

† See JUERGENSEN—*Embolische Pneumonie*, Ziemssen's Handb., Bd. V, Th. 2, Leipsic, 1874, S. 242, or Amer. Ed., Vol. V, New York, 1875, p. 245.

‡ In all, seven cases out of 667 autopsies, or rather more than one per cent.

cavity contained about three pints of fluid; in case 610 the left pleural cavity contained twelve ounces of purulent serum, (in this case the pericardium contained four ounces of serum and the abdominal cavity about twenty ounces;) in case 620 the right lung was coated with a large quantity of pus-like lymph; and in case 704 the right side of the chest contained fifty-four ounces of purulent serum.

If the foregoing summary account of the inflammatory affections of the respiratory organs observed in the chronic ulcerative cases be compared with the account given on page 315 of the similar complications in the non-ulcerative cases, and that given on page 457 of those observed in diphtheritic dysentery, the reader will not fail to be struck with the very great frequency with which these lesions accompanied the fluxes observed during the civil war. It must be remembered that in each instance the cases in which the inflammatory affection was a mere concomitant of phthisis have been rigorously excluded, such cases being separately enumerated under the head of tubercular disease of the lungs. I know of no other recorded statistics, except those of Griesinger, in which these inflammatory affections of the thoracic organs have played so conspicuous a role in the post mortem appearances of dysenteric subjects.*

*Pleuritic* adhesions of greater or less extent, and for the most part of ancient date, existed in many of the cases. Exclusive of those which were observed in connection with pneumonia and phthisis, they were noted, among the cases of follicular ulceration, on the right side in three instances; on the left in seven; on both sides in seven. Among the undetermined cases, on the right side in seventeen; on the left side in thirteen; on both

* It is not surprising that the occurrence of intercurrent pneumonia or other inflammatory affections of the respiratory organs should have failed to attract the attention of those who have studied dysentery in tropical lands. Thus, ANNESLEY—*Diseases of India*, London, 1828, Vol. II, p. 271—does not even mention them among the complications, and the same may be said of PARKES—*Dysentery and Hepatitis of India*, London, 1846, p. 38 *et seq.*—and MOREHEAD—*Disease in India*, 2d Ed., London, 1860, p. 271 *et seq.* JULIEN—*La dyssenterie en Cochinchine*, Montpellier Thesis, No. 62, 1864, p. 24—in his 108 autopsies seldom found any lung lesions. Occasionally some hypostatic congestion was observed in the posterior portion of the lungs; more rarely there was general pulmonary congestion. In one case pleurisy existed with considerable effusion. In the chronic cases complicated with dropsy, he sometimes found effusions of liquid in the pleural sacs and the pericardium as well as in the abdominal cavity. CATTELOUP—*Recherches sur la dyssenterie du nord de L'Afrique*, Recueil de Mém. de Méd., de Chir., et de Pharm. Militaires, T. VII, 1851, p. 87—went so far as to express the opinion that thoracic inflammations and dysentery are incompatible. He declared that in Algeria he had observed "a great number of cases of bronchitis and pneumonia, which are frequent during the winter, to be so favorably modified on the appearance of bloody alvine evacuations that the thoracic symptoms disappeared as by metastasis." GRIESINGER—*Krankheiten von Egypten*, Abschnitt X, Cap. 2, Archiv für Phys. Heilk., Bd. XIII, 1854, S. 539—alone, of the writers on the diseases of hot climates, appears to have found pneumonia a frequent complication. He relates with surprise that he found it more common in the dysentery of Egypt than in that of Germany. In 96 autopsies of primary dysentery he found lobar croupous pneumonia 7 times, and 12 times lobular scattered (not pyæmic) infiltrations associated with catarrh and œdema of the lung; 10 times he found considerable bronchitis, 4 times little apoplectic foci, and 7 times gangrene of the lungs. These results, which rival our own, must have been due to different causes. In the colder climates of Europe these chest complications might be expected to be, and undoubtedly are, more frequent than is usual in hot lands, but they do not attain the importance indicated by our own experience. According to HAUFF—*Zur Lehre von der Ruhr*, Tubingen, 1836, S. 315—serous effusions into the cavities of the pleura were occasionally observed by the Wurtemberg physicians; the lungs were often adherent to the pleura, partly congested—(theilweise infarcirt, blutreich; was this lobular pneumonia?)—usually of an ash-gray color. In seven cases HEIM observed a peculiar cinnabar-red color of a part or the whole of the lungs, which was sometimes superficial, sometimes penetrated more or less deeply into the parenchyma—S. 88. VOGT—*Monographie der Ruhr*, Giessen, 1856, S. 66—declared that all possible diseases of the bronchi, the lungs and the pleura may complicate dysentery, either being present before it begins or arising during its progress. He says, speaking of the cinnabar-red color of the lungs observed by the Wurtemberg physicians: "The observation is quite correct, and this cinnabar-red color is the same that STOKES regarded as the hyperæmia preceding pneumonia." ROKITANSKY—*Der dysenterische Prozess*, Oester. Jahrb., Bd. XX, 1839, S. 93—declared that in dysentery of an adynamic character, hypostasis of the lungs, sometimes developing into hepatization, is of frequent occurrence, but gives no figures to show how frequent. FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift, 1849, Bd. IV, S. 143—in 231 autopsies of dysenteries found lobular pneumonia in 16, in 5 of which the affected lobules showed no inclination to sphacelus; croupous pneumonia he found in but 2 of the autopsies; pleurisy was noted in 6 instances, in 3 of which it was associated with lobular pneumonia. This makes altogether 24 instances of chest inflammations, or rather more than one in ten autopsies of dysentery. LYONS—*Report on the Pathology of the Diseases of the Army in the East*, London, 1856, p. 51—declares in a general way the lungs to have been the organs which "exhibited the greatest tendency to secondary engagements in dysenteric cases," and during the Crimean war regarded this as the more remarkable, because "idiopathic affections of these organs have been of great rarity," (p. 87.) Two forms of pulmonary complication were observed: 1, bronchitis, usually accompanied by well marked spots of lobular pneumonia; and 2, "engorgements or actual exudations into the pulmonary parenchyma." To the description given of these latter lesions he adds, in a subsequent part of his report: "In some cases of chronic Dysentery, consolidation existed with small abscesses, varying in size from that of a pea to a considerably larger mass of broken down exudation, while some were nearly as large as a walnut, and not limited by any margin, but they were gradually broken up in the centre, while the friable edges mingled with congested and healthy parenchyma," (p. 88.) SAVIGNAC—*Traité de la Dysentérie*, Paris, 1863, p. 111—declares that phlegmasias of the respiratory organs are not common in the course of acute dysentery, but that chronic dysentery singularly predisposes to them. He points out as one cause of the complication in acute cases that patients who incessantly get out of bed in inclement weather without precaution are apt to catch cold. HEUBNER—S. 528, *op. cit.*, *supra*, p. 529—says merely of this complication: "Die Lungen bieten nach längerem Krankenlager die Zustände der Atelektase und lobulären Pneumonie." This remark, taken in connection with the report of his own dissections and those of SEITZ—both cited in note † to p. 438, *supra*—seems to show that intercurrent pneumonia was not frequent in the dysentery of the Franco-German war.

sides in twenty-four. Local thickenings of the pleura, generally supposed to be *cicatrices*, were observed in five cases, viz: in case 138 an "old stellate cicatrix," about two inches in diameter, was found on the convex surface of the lower lobe of the left lung; in case 316 "several dense fibrinous bands resembling cicatrices" were observed at the apices of the lungs; in case 717 a cicatrix was observed at the apex of the left lung; in case 856 there were "a few" cicatrices at the apex of each lung; in case 370 "the lower lobe of the right lung presented posteriorly a hard spot about two inches in diameter, which extended into the parenchyma about half an inch, and was apparently the result of former inflammation."

*Tubercular disease of the lungs* in various stages, with or without vomicæ or intercurrent inflammations, was observed in fourteen of the cases of follicular ulceration, viz: in the right lung in case 336; the left lung in cases 225 and 870; in both lungs in cases 142, 223, 266, 310, 316, 355, 379, 381, 500, 518 and 869. Similar conditions were observed in fifty-seven of the undetermined cases, viz: in the right lung in cases 80, 322, 450, 457, 510, 520, 624, 676, 707 and 720; in the left lung in cases 79, 275, 577, 623, 778 and 847; in both lungs in cases 78, 85, 88, 90, 91, 96, 189, 260, 289, 290, 307, 365, 487, 521, 550, 568, 578, 607, 609, 629, 647, 650, 651, 660, 662, 663, 670, 671, 703, 709, 717, 718, 719, 721, 722, 727, 734, 756, 791, 807 and 851. A single nodule, supposed to be of tubercular nature, was observed in the left lung in case 380, in the right lung in case 713. One or more calcareous nodules, probably obsolete tubercles, were found in the lungs in four of the cases of follicular ulceration, 196, 281, 853 and 856, and in five of the undetermined cases, 459, 622, 724, 728 and 743.

If to the cases of tubercular disease enumerated above, not including the single or obsolete tubercles just mentioned, we add those enumerated on page 458 as having been observed in the autopsies of diphtheritic dysentery, and on page 315 as observed in those of non-ulcerative intestinal inflammation, it will be found that tubercular disease of the lungs was observed in nearly one-sixth of all the autopsies of fatal cases of the forms of flux hitherto described;* a circumstance almost as remarkable as the frequency of acute inflammations of the respiratory organs commented upon above. This complication was undoubtedly most frequent in the chronic cases, but was observed also in the acute. In the first instance the chest affection appears to have been developed, in many cases, during the progress of the flux; in the second the dysenteric attack occurred in patients already laboring under phthisis, which exhibits no such antagonism to dysentery as Rokitansky was led to believe existed.†

* Viz: out of 156 autopsies of non-ulcerative intestinal inflammation, tubercular disease of one or both lungs was found in 24, p. 315, *supra*; out of 115 of diphtheritic dysentery, in 11, p. 458, *supra*; out of 103 of follicular ulceration, in 14; and out of 293 undetermined cases, in 57; total tubercular complication in 106 of 667 cases.

† ROKITANSKY—*Über Combination und wechselseitige Ausschliessung verschiedener Krankheitsprozesse, nach Beobachtungen an der Leiche*, Oesterreich. Jahrb., Bd. XVII, 1838, S. 220: "Es gehört zu den seltensten Fällen, entwickelte Dysenterie neben Lungentuberkulose zu sehen, wohl nie kommt sie neben Darmtuberkulose zur Entwicklung," S. 232. One of the earliest protests against this too exclusive view was made by BALY—*Gulstonian lectures on dysentery*, London Med. Gazette, Vol. IV, 1847, p. 489—who declared that "in the Millbank penitentiary, as well as in several other prisons, both dysentery and tubercular disease have prevailed together during many successive years," and that "amongst 27 cases during the last six years in which death was caused principally by tubercular disease of the lungs, there have been 10 in which that disease was combined during the last few days or weeks of life with active dysenteric disease of the large intestines;" in three of the 10 the form of disease was "gangrenous inflammation of the colon." FINGER—S. 134, *op. cit., supra*, p. 534—in 231 subjects dead of dysentery found tubercular disease 48 times. He states the fact also in another way: of 320 subjects dead of tubercular disease, dysentery was found 48 times, and he relates that he not merely found lung tuberculosis thus complicated, but also that in cases in which the tubercular disease of the lung was complicated by intestinal tubercle he saw the tubercular ulcers of the ileum coexist with the true dysenteric process in the colon, and also saw cases in which old tubercular girdle-ulcers of both small and large intestine coexisted with recent crompous exudates or small follicular ulcers. LYONS—p. 53, *op. cit., supra*, on p. 534—found tubercular disease a frequent complication, especially of the chronic cases of dysentery during the Crimean war. He remarks: "The clinical and pathological relations of Dysentery and Tubercle were obscure in the highest degree. From the great chronicity which the Dysenteric process assumed in the cases presented to our observation, marked constitutional effects were induced. It is not improbable that the cachectic state thus brought about was highly favourable to the development of Tubercle, in systems naturally predisposed to it. Some of the cases were undoubtedly of a Scrofulous type of constitution, and perhaps only required the stimulus of a chronic disease like Dysentery to call the latent process into action."

In addition to the foregoing lung lesions it may be mentioned that in case 868 the lungs are said to have contained "melanotic nodules;" and that in case 833 a neoplasm of undetermined nature, but of "cartilaginous hardness," was observed on the surface of the left lung, and masses of a similar character existed in the liver.

The condition of the *bronchial glands* is very often not mentioned in these autopsies. In a few instances they are spoken of as dark, or pigmented; in others as large, or enlarged; in some they are said to have contained calcareous matter; but their condition is so rarely reported as to make it probable that they were seldom systematically examined.

*Circulatory organs.*—Well marked *pericarditis*, characterized by the formation of lymph or pus as well as serum in the pericardial sac, was observed in one of the cases of follicular ulceration, 858, and in three of the undetermined cases, 614, 653 and 678; in all these cases pneumonia coexisted. In three others of the undetermined cases, 673, 742 and 743, slight pericarditis is said to have existed. The pericardium contained two ounces or more of *effused serum* in seven of the cases of follicular ulceration, viz: in case 86, ten ounces; in case 426, three; in cases 194, 387, 401, 428 and 870, two. Similar conditions existed in thirty of the undetermined cases, viz: in cases 228 and 618 the pericardium was "distended" with serum; in cases 254 and 655 it contained twenty ounces; in case 681, sixteen; in case 634, twelve; in cases 388 and 671, ten; in cases 80 and 676, eight; in cases 85, 648 and 792, six; in case 717, five or six; in case 601, five; in cases 84, 383, 572, 610, 636 and 680, four; in cases 604, 782 and 851, three; in cases 120, 250, 285, 448, 450 and 520, two. Besides these cases, quantities of serum, less than two ounces, were found in the pericardium, or it is simply said to have contained serum, without specifying the quantity, in seventeen of the cases of follicular ulceration and thirty-five of the undetermined cases. *Adhesions*, probably of ancient date, existed between the heart and pericardium in cases 319, 351, 523, 638 and 697; in cases 277, 509 and 663 the heart and pericardium were universally interadherent.

The *heart* is spoken of in a number of cases as pale, or soft or flabby, or thin-walled, or as having no fat or but little fat upon its surface; in a few instances its muscular tissue is said to have been fatty. In ten of the cases of follicular ulceration the heart is said to have been *small*, and in seven others this is shown by its weight, viz: in cases 379 and 414 the heart weighed six ounces and a half; in case 196, six ounces; in cases 198, 336, 350 and 398, five and a half ounces. Among the undetermined cases the heart is said to have been small in about a dozen cases, and in eighteen others this is indicated by its weight, viz: in cases 334, 356, 411, 418, 721, 742 and 767 it weighed six ounces and a half; in case 396, six and a quarter; in cases 292, 739, 759, 765 and 772, six; in cases 406,* 756, 802 and 803, five and a half, and in case 448 about four ounces.

*Valvular disease* of the heart was observed in two of the cases of follicular ulceration, affecting the aortic valves in case 746, the aortic, mitral and tricuspid in case 870; and in eight of the undetermined cases, affecting the aortic valves in case 835; the mitral in cases 319, 735 and 786; the mitral and tricuspid in case 787, and probably case 509; in cases 743 and 745 the particular valves affected are not specified. In case 746 the valvular disease was associated with exquisite calcareous atheroma of the aorta;† atheroma of the aorta, in a less marked degree, was also observed in case 869. In cases 458, 461 and 541

* This heart is preserved in the Museum, Med. Sect., No. 403.

† The specimens are preserved in the Museum, Nos. 310, 311 and 312, Medical Section.

the foramen ovale still remained patulous. In case 454 the left pulmonary veins opened into the auricle by but a single opening.

If the cardiac lesions just enumerated be compared with those observed in the cases of non-ulcerative intestinal inflammation* and diphtheritic dysentery,† it will be noticed that the most significant lesions were very similar in each case. These were the occasional occurrence of acute pericarditis, which, as a rule, coexisted with pneumonia or pleurisy, the frequent presence of more or less effused serum in the pericardial sac, and a few examples of chronic valvular disease, which probably antedated the dysentery. To these must be added the small, pale, flabby, or even fatty condition of the heart, which was very often observed, particularly in the chronic cases; a condition I suspect to have existed more frequently in this group of cases than is indicated by the record, and which results from the protracted inefficiency of the nutritive processes in these cases.‡

*Heart-clots.*—Whitish or yellowish fibrinous coagula, either alone or associated with black clots, are recorded to have been observed in the cardiac cavities of one or both sides in a considerable number of instances. Among the cases of follicular ulceration such clots were observed on the right side in cases 140, 142, 145, 293, 368, 371, 381, 426, 427 and 428; on the left side in cases 227, 336 and 363; on both sides in cases 194, 198, 201, 223, 333, 370, 379, 389, 454 and 870. These clots extended both into the pulmonary artery and aorta in cases 194, 198, 201 and 870; into the pulmonary artery in cases 368, 370 and 371; into the pulmonary veins in case 454, and into the superior vena cava in case 370. In several other cases clots are said to have existed in the cardiac cavities, but their characters are not specified; in about half a dozen more, black clots only were found.

Among the undetermined cases fibrinous or mixed clots were observed in the right side in cases 89, 384, 388, 410, 620, 621, 738, 755, 802 and 810; in the left side in cases 228, 304, 396, 722 and 778; and in both sides in cases 275, 356, 375, 383, 407, 417, 418, 420, 448, 449, 452, 610, 614, 721, 724 and 768. The clots extended into the aorta in case 356; the pulmonary artery in cases 375, 620 and 621; the vena cava in case 375. There were also about a dozen cases in which clots are said to have existed, but their character is not specified, and about half as many more in which black clots only were found. There were also a few cases in which clots are mentioned without specifying either their character or the side on which they were found. If the foregoing observations be compared with those made in connection with the non-ulcerative and diphtheritic cases,§ it will be seen that fibrinous heart-clots are recorded to have been observed in more than one hundred of the autopsies, and it must be borne in mind, too, that in the majority of the autopsies no mention is made of the character of the cardiac contents, so that the percentage of cases in which this accident occurred is understated rather than exaggerated by the record.

Fibrinous concretions in the cavities of the heart began to attract the attention of pathologists soon after dissection was revived in Europe. Towards the close of the fifteenth

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* *Supra*, p. 315. † *Supra*, p. 458.

‡ According to HAUFF—S. 315, *op. cit.*, *supra*, p. 534—the Wurtemberg physicians noticed the occasional occurrence of serum in the pericardium, and that the heart was sometimes small, sometimes flabby (bald welk und schlapp, einen häutigen Sacko ähnlich) during the epidemic of 1834. VOGT—S. 66, *op. cit.*, *supra*, p. 534—observed the complication with pericarditis, and remarked that dysentery may coexist with any organic disease of the heart. FINGER—S. 143, *op. cit.*, *supra*, p. 534—does not appear to have noticed these lesions. He mentions only that in 231 autopsies he saw moderate endocarditis twice, and a few instances of coagulation of the blood of certain veins, viz: 3 times in the sinuses of the brain, 3 times in the veins of the lower extremities, and once in the portal vein. The case in which the portal vein was involved was a woman 54 years old, and the lesion is said to have been diagnosticated during life by Prof. OPPOLZER. LYONS—p. 50, *op. cit.*, *supra*, p. 534—occasionally observed serous and sero-purulent accumulations in the pericardial sac in Crimean dysentery. HEUBNER—S. 528, *op. cit.*, *supra*, p. 534—remarks: "The heart is flabby, (schlaff.) The blood mass is considerably diminished, therefore all the organs are very anæmic."

§ Pages 316 and 458, *supra*.

century Benivenius* observed a blackish fleshy body in the left ventricle of a woman, and supposed it to have caused her death. During the sixteenth century whitish or yellowish fibrinous clots were found in the cardiac ventricles by a number of observers. Similar clots, seen in the sinuses of the brain by the barber-surgeons who accompanied the Hungarian campaigns, were supposed to be worms, and this notion having been extended to the cardiac coagula, was accepted by some as late as the seventeenth century, as is illustrated by the celebrated case observed by Edward May in 1637.† But from a very early period, less credulous observers, such as Helidæus, Coiter and Erastus, described the cardiac coagula as composed of concreted phlegm,‡ and Coiter sharply ridiculed for their credulity the barber-surgeons who supposed them to be worms.

I note that according to Morgagni,§ Fabricius Bartoletus (1633) first spoke of these concretions as "polypoid." I note also that Tulpius,‖ in 1641, described a concretion found

* BENIVENIUS—*De abditis nonnullis ac mirandis morb. et san. causis*, Cap. 35; I cite the Paris Ed. of 1529, fol. 9—described the substance found as "frustulum nigrioris carnis in sinistro cordis ventriculo supra arteriam, quod mespilii formam haberet." I suppose this to have been merely a firm black blood clot, and put the same interpretation upon the mass of glandular but blackish flesh, almost two pounds in weight, ("carnis libras propemodum duas reperimus, corde instar uteri,") which VESALIUS found, some fifty years later, in the left ventricle of a man who for some time had been troubled by a very irregular pulse, which at times beat as if the heart were endeavoring to expel something—*De Humani Corp. Fabr.*, Lib. I, Cap. 5; I cite the Venice Ed. of 1568, p. 15: this case is not related in the Basel Ed. of 1543, but was introduced in the edition of 1555.

† According to COITER—*Extern. et intern. princip. humani corporis partium tabulæ, atque anatomicæ exercit. observationesque*, etc., Nuremberg, 1573, p. 110—many physicians, but especially the barber-surgeons, ("barbi tonsores,") had observed the conditions referred to in the text. They supposed that in the Hungarian fever the brain putrefied, and that worms were thence generated; and interpreted the concretions they sometimes saw in the hearts of these patients in the same way, calling them heart-worms, ("die hertz würme.") COITER ridicules these notions, and declares that the vermiform concretions found by him in the cerebral sinuses and heart of a woman, who died of a phrenzy supervening upon an ardent fever in 1567, were composed of white phlegm, ("alba pituita conflata,") and states that he had observed similar appearances in the brain sinuses of persons dead by hanging. HOLLERIUS—*De Morb. Intern.*, Venice, 1572, Lib. I, Cap. 27, scholia, fol. 79—attributed the notion that worms in the heart were the cause of cardiac palpitations to MESUE, ("vermibus cor vellicantibus, ut vult Mesne,") who wrote in the eleventh century; but this was not an opinion based upon anatomical observation, but a notion suggested by the analogy of intestinal worms, as may be seen in the passage referred to. MESUE—*Grabadin, id est compend. secret. medicament.*, Lib. II. Partic. 2, Summa IV, Cap. I, Opera, Venetiis, apud Juntas, 1581, fol. 272—"Et sunt ex vermibus habentes aculeos pungentes orificium stomachi punctione vehementi, donec faciant cadere in dolorem acutum causam ad syncopim, et aliquando ad mortem; et sunt quandoque ex penetrantibus usque ad cor, et sunt causa mortis festinæ." On the other hand VIDUS VIDIUS (died 1569)—*De curatione membratim*, Lib. VIII, Cap. I; I cite Opera, Frankfort, 1626, T. II, p. 271—evidently had in view observations such as those criticized by COITER, though he regarded them with greater credulity, when, speaking of the anomalous contents of the cardiac ventricles in disease, he wrote "ad quas potissimum vermes referuntur, quos aliquando in pestiferis febribus, in ventriculis cordis fuisse genitos, audivimus ab hominibus fide dignis, qui ejusmodi aegrotantium cadavera secuere, quamvis verisimile sit raro admodum istud contingere." Several other observations of cases in which worms were supposed to have existed in the heart were collected by SCHENCKIUS—*Obs. Med.*, Frankfort, 1609, Lib. II, p. 296—under the heading "Vermes cordis." BONETUS—*Sepulchretum*, Geneva, 1679—repeated some of these cases, and added others in which cardiac worms were supposed to be the cause of syncope, Lib. II, Sect. 10, Obs. 7, p. 681; and even of sudden death, Lib. II, Sect. 11, Obs. 3, p. 695. The observation of MAY, mentioned in the text, has recently been reprinted by RICHARDSON (p. 67, *op. cit.*, *infra*) from a "quaint paper" in the library of the "Medical Society," which I have never seen. I find the case, however, related by ZACUTUS LUSITANUS—*De praxi med. admir.*, Lib. II, Obs. 140, p. 37, in Opera, T. II, Lyons, 1649—and by MARCUS AURELIUS SEVERINUS—*De recondita abscessuum natura*, Ed. secunda, Frankfort, 1643, Lib. IV, ad fin., p. 281—under the title "Historia mirabilis anguis bifidi flagellosi in lævo cordis sinu reperti," illustrated by two figures etched on copper, one of which, representing the supposed worm, has been copied by RICHARDSON, (*loc. cit.*) It had a bloody head and a straight cylindrical body which divided into two crura or thighs, and these again each into several smaller branches. MAY thought it had a central intestine or bloodvessel, which opened between the thighs by an orifice capable of receiving a probe. The other figure, representing the heart with the worm coiled up in it, is evidently, from the manner in which the heart is represented, drawn from memory rather than from the object; and I suspect that the clot never had the position shown, but that its trunk passed through the semilunar valves and bifurcated at the junction of the aorta and innominate artery, forming the crura, while the secondary branches were formed further on, as in the very similar clot in specimen No. 638, Medical Section, Army Medical Museum.

‡ According to SPIGELIUS—*De semitertiana* (1624) Lib. I, Cap. 15; I cite Opera, Amsterdam, 1645, *De semitert.*, p. 10—HELIDÆUS of Padua, some time during the previous century ("præterito seculo") dissected, in the hospital at Bologna, the body of a subject dead of a protracted quartan in whose heart and veins long white fragments of phlegm were found, ("frusta magna, longa, alba, pituitosa.") MORGAGNI—*De Sed. et Causis Morb.*, Lib. II, Epist. 24, § 22—gives HELIDÆUS the credit of being next after BENIVENIUS to observe cardiac coagula; but he does not state when he made the observation recorded by SPIGELIUS, or, indeed, when he lived, relating only, in order to approximate the period, that he was the preceptor of FORESTUS. Now FORESTUS commenced the study of medicine about the year 1539 at Louvain, went into Italy about four years later, where first probably he could have studied with HELIDÆUS; this can hardly fix the date of the observation in question. The observations of COITER are mentioned in the last note. ERASTUS—*Disp. de feb. putrid.*, Basel, 1580, Part 5; I cite from SCHENCKIUS, *Obs. Med.*, Frankfort, 1609, Lib. II, p. 298—found a concretion of pituitous humor, "concretio quædam humoris pituitosi," which resembled the marrow of cooked beef bones, in the hearts of two subjects dead of fever and pleurisy. I may add that SCHENCKIUS also relates (*loc. cit.*) that NERETUS NÉRETIUS, a physician of Florence, observed a "whitish fleshy substance" in the left ventricles of four subjects dead of pleuropneumonia, and also in the right ventricle of a woman dead of the same disease, in whom it extended a long distance into the vena cava.

§ MORGAGNI—*De Sed. et Causis Morb.*, Lib. II, Epist. 24, § 24—the word used by BARTOLETUS was "polypodi."

‖ TULPIUS—*Obs. Med.*, (1641;) I cite the Amsterdam Ed. of 1652, Lib. I, Cap. 27, polypus cordis, p. 55. The concretion in this case is represented by an admirable etching on copper. It lay in the left ventricle, adhering by many branching roots to the columnæ carneæ of the heart, thence it stretched through the aortic orifice, and shortly after branched. TULPIUS falls into the palpable error of supposing one of these branches to lie in the aorta, the other in the pulmonary artery, (arteria venosa;) for, of course, the branches were formed, one in the aorta, the other in the innominate artery. He says the name polypus was given partly from its many feet, (*i. e.*, filaments adhering between the columnæ carneæ and chordæ tendineæ,) partly from its similitude in form and material to polypus of the nose, a case of which he had described in the previous chapter, (Cap. 26, Polypus narium,) in which he says the name polypus is derived either from the marine creature so-called, (à pisce marino,) or from the number of feet, (*i. e.*, roots.) He supposed the cardiac concretion he described to have caused death by preventing the closure of the aortic valves and otherwise interfering with the functions of the heart.

in the left cardiac ventricle, which the physicians who witnessed the dissection, with one consent, called a polypus of the heart, so that Schroetter* is certainly in error when he declares that these coagula were first so designated by Sebastian Pissinius,† whose essay, De Polypo Cordis, was not published until 1654. A few years later Thomas Bartholinus‡ published, (1657,) under the title Polypus Cordis, an observation made by Michael Kirstenius in 1651, which, like that of Tulpius, is illustrated by an excellent etching on copper. After this, observations and essays multiplied.§ It was generally agreed that the polypi were composed of concreted phlegm; that they were formed during life, and the most various symptoms were attributed to them, such as irregularities of the pulse, palpitation of the heart, embarrassed respiration, suffocative catarrh and sudden death.

Kerckringius‖ appears to have been the first to have raised his voice against this popular opinion, declaring that the so-called polypi were merely coagula formed from the blood after death, and that the symptoms attributed to them were really due to other causes. Similar views were maintained by Pasta,¶ 1737, in a dissertation which appears to have convinced Morgagni,** in whose work the subject is treated in the most elaborate manner. Morgagni concluded that cardiac polypi were composed of the very same substance as the buffy coat that forms on blood drawn from a vein, and that while they might possibly sometimes form during the last moments of life, or during protracted syncope, yet that in most instances they were of post mortem origin.

On the other hand, Haller,†† while he admitted that cardiac coagula were so common that a dead body is seldom dissected in which they are not found, especially on the right side, declared that he was by no means willing to strike polypus of the heart from the number of diseases. True polypi, as he called them, firm, white coagula, formed of many concentric laminæ, more or less fibrous in texture and adherent to the interior of the heart, were so often observed in individuals whose death had been preceded by cardiac palpitations, irregular pulse, difficult respiration and the like, that he held fast to the belief that these

* SCHROETTER—*Gerinnungen im Herzen*, Ziemssen's Handb., Bd. VI, Leipsic, 1876, S. 268; or Amer. transl., Vol. VI, New York, 1876, p. 292. In most respects an excellent, though brief, article.

† S. PISSINIUS—*De diabete et polypo cordis*, Milan, 1654; I have not seen this essay, and cite the title from HALLER—*Bibl. Med. Pract.*, T. II, Basel, 1777, p. 406. MORGAGNI *(loc. cit.)* assigns it to the same date.

‡ BARTHOLINUS—*Hist. Anat. Rar. Cent. III*, Copenhagen, 1657—Hist. 17, *Polypus cordis*, p. 39. In this case there were fibrinous clots in both sides of the heart, extending from the right ventricle into the pulmonary artery and its branches, and from the left ventricle into the arch of the aorta and its branches. Fibrinous clots were also found in the cerebral sinuses. The copper etching is very graphic, although less artistic in its execution than that published by TULPIUS. BARTHOLINUS expressly states that this observation was made in 1651.

§ As, for example, MALPIGHIUS—*Diss. de polypo cordis*, Amsterdam, 1669; I cite Opera, Leyden, 1687, T. II, p. 311; GERARD BLASIUS—*Obs Med. Rar.*, Amsterdam, 1677, Pars 6, Obs. 1, p. 73, *Polypus cordis*, illustrated by two figures, Tab. VIII, Figs. 1 and 2; and the cases collected by BONETUS—*Sepulchretum*, Geneva, 1679, viz: Lib. II, Sect. I, Obs. 92, 93, 94 and 95, pp. 430–31, and Lib. III, Sect. 21, Obs. 3, p. 1037 *et seq.*, which contains a number of observations with interesting scholia on pp. 1046–47, &c.

‖ TH. KERCKRINGIUS—*Spicilegium Anatomicum*, (1670;) I cite Opera, Leyden, 1717, p. 145. He called them "pseudopolypi," and declares "nihil enim aliud sunt, quam sanguis, qui post animalium mortem refrigeratus et grumosus, durusque redditus," &c., adding further the notable statement that he had been able to produce them in animals as often as he pleased. Rough etchings are subjoined in Tab. 23, showing various pseudopolypi.

¶ ANDREA PASTA—*Epist. ad Alethophilum dum*, Bergamo, 1737, Epist. 2, *De Cordis polypo in dubium revocato*, p. 9 *et seq.* A most interesting essay, in which abstracts of almost all the previously published observations are given, and the objections of the author to the generally accepted view supported by admirable arguments. The same opinions had previously had the support of the observations of LOUIS PETIT—*Second mémoire sur la manière d'arrêter les hémorrhagies*, p. 388 of Mémoires appended to Hist. de L'Acad. Royale des Sci., 1732, Paris, 1735—who, after stating that the "lymphatic part" of the blood only coagulates, and that in doing so it sometimes, but not always, entangles the "globulous or red part" with it, remarked that ordinarily on opening cadavers the blood is found coagulated in the heart and vessels, but not always in the same way; sometimes the red part is exactly mingled with the lymphatic, forming a red firm clot, while at other times the clot is composed of two parts, one white, composed of lymph, and the other red. Moreover, since the lymphatic part is the lightest it will be uppermost, provided the cadaver has grown cold in the horizontal position, as is usually the case.

** MORGAGNI—*Op. cit.*, Epist. 24, § 22–31; also Epist. 4, § 22; Epist. 17, § 29; Epist. 18, § 9; Epist. 52, § 34, and Epist. 64, § 9.

†† ALBERT V. HALLER—*Elementa Physiologiæ*, Lib. V, Sect. I, § 11, T. II, Lausanne, 1760, p. 23—while emphasizing the firmness, laminated or even fibrous character, &c., of what he called "polypi veri," nevertheless denied that they are ever enveloped in true membranes, or that these membranes are ever vascular, as some had asserted: they are simply blood coagula, often formed after death, but very often also during life. Similar coagula had been observed also in the lower animals, as in the elephant, the lion and the horse. I may add that the discussion is enriched with a bibliography worthy of all praise. Indeed, I may say that the works of MORGAGNI (cited last note) and HALLER are the best guides for the modern student to the early literature of this subject. I may also mention in this connection the essay of JOSEPH PASTA—*De sanguine et de sanguineis concretionibus*, &c., Bergamo, 1786—a work of 157 pp., 8vo, in which the opinions of ANDREA PASTA are maintained and copious references to the literature given.

symptoms were actually produced by the concretions found after death. Whatever impeded the motion of the blood through the heart might give rise to coagula, as in aneurisms or after arteries are ligated. Hence polypi were so frequently found in patients who have suffered from asthma, pneumonia and phthisis. The credit of having first proposed the distinctions just mentioned between true polypi, or those formed during life, and mere post mortem coagula, has been erroneously attributed to Corvisart,* who, however, did nothing in this respect but follow in the footsteps of the great physiologist.

Kreysig† advanced the opinion that these polypi were products of an inflammation of the endocardium, and asserted the existence of a genuine carditis polyposa. This opinion was widely accepted as an explanation of a portion of the cases, at least, notwithstanding the objections urged against it by Laennec.‡ To Laennec belongs the credit of having directed attention to those cyst-like formations, which he called "*végétations globuleuses*," and the contents of which he supposed in some cases to be altered blood or decomposing fibrin; in others true pus. This latter opinion was shared by Legroux § and several subsequent writers. Even Cruveilhier,‖ who earnestly combated the suggestion of Legroux that the cardiac concretions might be themselves the seat of a suppurative inflammation, does not appear to have doubted that these cysts sometimes actually contain pus; a belief which, in the present condition of pathological histology, is no longer tenable.

The opinion that certain varieties of fibrinous concretions might form in the heart at variable periods before death was now fixed upon a firm foundation. Babington ¶ vainly protested against it. It was sustained by Bouillaud, Hughes and Rokitansky, who agreed as to the general proposition, though differing somewhat in matters of detail. The same

* J. N. CORVISART—*Essai sur les maladies et les lésions organiques du cœur et des gros vaisseaux*, 1806; I cite the 2d Édit., Paris, 1811, p. 458, *Des concrétions polypiformes*. Among those who have fallen into the error referred to in the text, I may mention BOUILLAUD—cited note *, p. 541, *infra*—and COPLAND—cited note ‖ on the same page.

† KREYSIG—*Die Krankheiten des Herzens*, Th. 2, Abth. 1, Berlin, 1815, S. 90 und 396; I have not been able to see this work, and cite from FRIEDREICH—*Herzkrankheiten*, in Virchow's Handb. der Spec. Path. u. Ther., Bd. V, Abth. 2, S. 401 u. 404.

‡ LAENNEC—*Traité de L'Auscultation Médiate*, (1819;) I cite the 4me Edit., Paris, 1837, T. III, Ch. 18, p. 289 *et seq.* He agreed substantially with HALLER and CORVISART in the distinction between recent and old congula. In the first or recent concretions there is a thin fibrinous layer around clots of cruor, which resembles the buffy coat, or, if denser masses are formed, they are not usually adherent to the heart; sometimes they are jelly-like and semi-transparent, but not firm nor distinctly fibrinous. The second or more ancient concretions are firm, sometimes almost as tough as muscular tissue, and are more or less strongly adherent to the internal surface of the heart. They are more opaque than the others, and their fibrinous character is better marked. He even supposed that in some cases he saw rudimentary bloodvessels, the organization of which proceeded as in the fœtus, ("l'organisation vasculaire se développe à peu près comme chez le fœtus.") He found such concretions most frequently in the right cavities of the heart. While combating the opinion of KREYSIG, (p. 313 *et seq.*,) he admitted that the adhesions between the polypi and the cardiac walls may be due to inflammation of the latter, but if so, thought the inflammation was probably a secondary process due to the irritating action of the clot itself, ("l'action irritante du caillot lui-même sur les parois du cœur, qui peut déterminer l'exsudation d'une lymphe plastique," p. 315.) On the other hand, he held that the polypoid concretions are themselves living and capable of organization, and that the adhesions may depend on this. The chief merit of LAENNEC in this connection, however, is his admirable description of what he called "végétations globuleuses," p. 344 *et seq.* These were spheroidal or oval cysts, varying in size from that of a pea to that of a pigeon-egg, whitish and smooth on the exterior, their walls opaque and seldom more than half a line in thickness. The contents resembled half-liquid blood of turbid appearance, as if an insoluble powder had been stirred in; or was more pultaceous, resembling the lees of wine; or, finally, yellowish and opaque, resembling thick pus, or evidently formed of decomposed fibrine, such as is sometimes observed in aneurismal sacs. Such cysts are found adherent to the parietes of the ventricles or the sinuses of the auricles, and are as frequent in the right side of the heart as in the left. The pus-like contents of some of these cysts he held to be really pus, and endeavored to distinguish it from decomposed fibrine, ("dans les plus anciennes une matière qui paraît être du pus, car il en a la couleur jaune citron, et non la couleur jaune fauve de la fibrine décomposée," p. 348;) but since pus was not always present, he would not admit that the cysts owed their origin to inflammation, and thought it wiser to leave the question of their causation an open one, p. 350. I may add that ALLAN BURNS—*Obs. on some of the most frequent and important Diseases of the Heart, etc.*, Edinburgh, 1809, p. 200—had previously described a polypus "more than one inch in length in the left ventricle" attached to the septum of the heart, in the centre of which he found an abscess which, "when opened, discharged above a teaspoonful of perfectly formed purulent matter."

§ C. J. LEGROUX—*Rech. sur les concrétions sanguines dites polypiformes, développées pendant la vie*, Paris Thesis, No. 215, 1827—held also that these concretions were in some cases connected to the cardiac parietes by vessels of new formation, (p. 35.) He believed that in some cases an inflammatory process was set up in the concretion, resulting in the formation of pus.

‖ J. CRUVEILHIER—*Anat. Path. du Corps Humain*, T. II, Paris, 1835–42, Livraison 28. He, too, held that some concretions were merely mechanically adherent, others organically united to the walls of the heart. Purulent cysts belonged to the latter category, and are united by inflammation to the cardiac walls whence the pus is derived, ("le pus central de ces caillots a sa source dans la membrane interne du cœur.") In Plate 4, Fig. 1′ and 1″, he gives colored representations of such a pus-containing clot.

¶ B. G. BABINGTON—*Blood, morbid conditions of*, in Todd's Cyclopædia of Anatomy and Physiology, Vol. I, London, 1835–6, p. 421: "That such coagulation may take place during life I am willing to admit, but I am by no means led to the conviction that such an event often occurs. To the formation of a firm coagulum I am persuaded that rest is absolutely necessary, and I must consider it as a very rare occurrence that the contents of the cavities of the heart should be at rest during life." The usual appearance of the concretions "is such as would take place in blood that coagulated very slowly, whether in or out of the body."

view has been maintained in the most recent times, especially by Gerhardt and Richardson,* who have once more revived the attempt to diagnosticate the presence of these concretions during the life of the patient. The chief symptoms relied upon by Richardson for this purpose are the sudden occurrence during an acute inflammatory attack, or during the puerperal state, of a peculiar and distressing dyspnœa, small intermittent pulse, venous congestion of the lips and cheeks accompanied by coldness and whiteness of the general surface, muscular prostration with constant restless motion of the limbs, involuntary discharge of the excretions, and death. This train of symptoms is supposed to indicate the formation of fibrinous concretions in the right side of the heart; if the patient does not speedily perish, the venous obstruction produced by the foreign body in the right cardiac cavities may even lead to general anasarca. When the concretion forms in the left side of the heart the symptoms are somewhat different; congestion of the lungs and suffocative dyspnœa are then prominent phenomena; the muscular perturbation lapses into violent convulsions, and coma precedes dissolution.†

These symptoms are not materially different from those relied upon for the same purpose by previous writers, particularly by Senac, Laennec and by Bouillaud.‡ In addition to these, Gerhardt § has pointed out that heart-clots, especially in the cavities of the left side, may become the source of emboli, and endeavored to trace some connection of diagnostic worth between their seat and number and the seat of the original concretion in the right or left heart, but, as he himself confesses, with slender results. I must, however, certainly agree with Schroetter,‖ that all the symptoms brought forward may also result from other causes than cardiac concretions, and cannot therefore be regarded as characteristic; and I may add that Richardson himself admits that there are no reliable physical signs by which the concretions can be detected.¶

The proposition that certain cardiac concretions are formed during life would appear, then, to rest exclusively upon the anatomical characters of the concretions found. It is

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* BOUILLAUD—*Nouvelles rech. clin. sur les concrétions sanguines formées pendant la vie*, &c., L'Expérience, T. III, 1839, pp. 273 and 337. H. M. HUGHES—*Obs. on fibrinous concretions in the heart*, Guy's Hospital Reports, Vol. IV, 1839, p. 146. ROKITANSKY—*Bemerkungen und Zusätze, betreffend die faserstoffigen Gerinnungen in den Herzhöhlen*, etc., Oesterreich. Med. Jahrb., Bd. 24, 1841, S. 53. According to this observer, the conditions which determine the development of heart polypi during life may be divided into two groups: 1, A preternatural inclination to coagulation on the part of the fibrin of the blood, either from idiopathic disease or the admixture of foreign matters. Such an anomalous condition of the blood occurs in ordinary inflammation, in croup, rheumatism, and in blood-poisoning by the absorption of the products of inflammation. 2, Conditions favoring an unnatural delay or even stasis of the blood-mass in the cardiac cavities, such as (a) depression of the heart's function, as in hypertrophy with dilatation, and during the agony if the heart gradually becomes paralyzed; or (b) stenosis of the cardiac orifices. As to their form he distinguished three kinds of fibrinous concretions in the heart: 1, Lumpy or stringy-like coagula, which are the more entangled with the trabeculæ of the ventricles the longer before death they were formed; 2, vegetations on the cardiac valves; 3, spherical vegetations, (*végétations globuleuses* of LAENNEC.) The fluid contained in these, as GULLIVER had previously pointed out, is not pus, but a mass of molecular debris derived from the decomposition of the fibrin, in which only here and there a pus corpuscle (?) swims. In his *Lehrb. der Path. Anat.*, Bd. II, 3te Aufl., Vienna, 1856, S. 283, he makes the spherical vegetations a mere variety of the first kind, but otherwise holds substantially the same views as in his original paper. C. GERHARDT—*Ueber Blutgerinnung im linken Herzohre*, Würzburger Med. Zeitschrift, Bd. IV, 1863, S. 151. BENJ. W. RICHARDSON—*On fibrinous deposition in the heart*, British Med. Jour., Jan. 1860, pp. 21, 45 and 65; *On treatment in extremis of acute cases of fibrinous deposition in the heart*, abstract of a paper read before the Medical Society of London, Med. Times and Gazette, June, 1873, p. 636; and *The cause of the coagulation of the blood*, &c., London, 1858.

† RICHARDSON, p. 423 *et seq.*, work last cited. With regard to the symptom of anasarca, I may cite the following passage: "In one instance which I observed, the symptoms of dyspnœa extended over many days, and anasarca supervened as a result of the obstruction."

‡ SENAC—*Traité de la Structure du Cœur, de son action et de ses Maladies*, Paris, 1749, T. II, Liv. IV, Ch. 10, p. 412 *et seq.* Note particularly his remarks on the symptoms produced, pp. 470–77. LAENNEC, *loc. cit.* in note ‡, p. 540, *supra*. BOUILLAUD, *loc. cit.* in note *, *supra*.

§ GERHARDT—*loc. cit.* in note ", *supra*.

‖ SCHROETTER—*loc. cit.* in note * to p. 539, *supra*. The reader desirous of investigating this interesting subject for himself will find, prefixed to the article of SCHROETTER cited, references to a number of the more important modern papers. Brief bibliographies are also given by COPLAND—*Of polypous concretions in the cavities of the heart*, Art. *Heart and pericardium*, Dict. of Pract. Med., Vol. II, London, 1844, p. 228, (the article itself contains several historical inaccuracies on p. 220,) and FRIEDREICH—*Gerinnungen im Herzen*, in Virchow's Handb. der Spec. Path. u. Ther., Bd. V, Abth. 2, Erlangen, 1855, S. 401. From these references, and those given by MORGAGNI and HALLER, a good survey of the subject may be obtained. There are, moreover, a number of reports of single cases scattered through the medical journals, which it would be profitable to collect.

¶ BOUILLAUD—p. 277, *op. cit.*, *supra*—spoke of a characteristic whispering murmur, "un bruit de piaulement, * * un bruit de sifflement aigu," but admits that he has also heard these sounds in cases in which no concretions were found after death in the cardiac cavities. RICHARDSON—*op. cit.*, p. 429—speaks of "a peculiar rumbling, fidgety, jog-trot motion, with which the two sounds are heard in natural sequence as regards each other, but irregularly and lispingly." But this able observer did not attach undue importance to such uncertain signs, and cautiously adds: "The diagnosis must therefore rest on the general symptoms, rather than on the physical."

now admitted on all hands that mixed clots, in which the upper surface consists of a layer of fibrin, shading more or less gradually into a soft mass of cruor below, are formed after death, and that clots composed of completely separated fibrin must have been formed either during the death agony or at some previous period. A distinctly laminated or fibrillated texture of the clot and its firm adhesion to the cardiac parietes have been regarded by many, ever since the time of Haller, as proof that it was formed some time before death. But the texture of the clot varies quite as much with the varying qualities of the blood-fibrin in different individuals as with the time that has elapsed since the coagulum began to form. The variations in the buffy coat of blood drawn from a vein illustrate this proposition. If the fibrin of the blood were simply whipped out by the projecting irregularities of the cardiac cavities during the last moments of life, and allowed to repose for a variable period after death before it was examined, it is not unreasonable to believe that all the various degrees of lamination, fibrillation, firmness or softness, commonly found, would be observed; the variations depending rather upon the composition of the blood-fibrin than upon the circumstances under which the clot was formed.

The degree of adhesion to the cardiac parietes likewise depends, so long as this adhesion is purely mechanical, merely on the varying composition of the blood-fibrin. Nor can I regard the circumstance that a clot is grooved externally by the blood current, or hollow, as if it had formed around a blood stream, or deeply indented by surrounding structures, or that long branches proceed from it into the great vessels that open into the heart, as proof that it was formed at any considerable period before death. All these conditions might be expected to occur, in favorable conditions of the blood-fibrin, during the few minutes of the death agony, while the vitality of the blood was gradually diminishing and the heart still feebly acting. Even if the clot completely fills one of the cavities of the heart, for example the right auricle,* there is no reason to conclude from that circumstance that it was formed otherwise than during the agony; and the same may be said with regard to the disproportion between the weight of the heart-clot and the quantity of blood found along with it in the cardiac cavities, which has been insisted upon by Richardson† as proof of the ante mortem formation of such clots. Finally, I may remark of the ingenious experiments in which Richardson has artificially developed heart-clots in living animals, that the evidence does not satisfactorily show that the clots found were actually formed at any earlier period than during the agony.‡

* Thus ROKITANSKY—*Lehrb. der Path. Anat.*, 3te Aufl., Bd. II, Vienna, 1856, S. 284—records a case in which the whole left ventricle was stuffed with what he calls leukæmic clots, (leukämische Gerinnungen.) The patient was a woman, 42 years old, who had a splenic tumor and dysentery. RICHARDSON—*op. cit.*, p. 403—reports three cases in which the right auricle was completely filled with fibrinous clots; one a child who died of acute laryngitis, the second a child who died of pneumonia, the third an infant who suffered from hypertrophy of the spleen and purpura. C. HOUSLEY—*Death from fibrinous concretions in the right side of the heart*, Med. Times and Gazette, Vol. XVI, 1858, p. 425—reports a similar coagulum in the right auricle of a child 2 years old, who had pneumonia of a part of the right lung. According to SCHROETTER, *loc. cit.*, VIRCHOW observed a similar coagulum in the left auricle. Now it seems self-evident to me that the last increments of such bulky concretions could only have been formed during the agony, and I see no reason to suppose that the whole mass might not be separated from the blood in a very few minutes, especially when we consider the disposition to coagulation which exists in inflammatory blood.

† RICHARDSON—Brit. Med. Jour., Jan., 1860, p. 65—has laid great stress upon this argument, which certainly shows that the large clots in question must be formed while the heart is still beating; but, as during the death agony the whole blood of the body must pass at least several times through the heart, this argument is of no force if used to favor the belief that the clots antedate the agony.

‡ RICHARDSON—*Op. cit.*, p. 67—says that the best way of performing these experiments is to place a carnivorous animal in a chamber supplied with a current of pure freshly-made oxygen: "When the animal begins to fail, or, in other words, to sink, there is manifested in all his movements the signs of obstruction of the heart—signs which will hereafter be more carefully indicated. The sinking fully set in, (for, before the sinking, there is no concretion, the prostration being the mere result of the obstruction,) narcotic vapour is introduced into the chamber, and, insensibility complete, the vivisection is made. I have extracted large concretions from six animals under this condition." Now this language seems to show pretty conclusively that the concretions were not found if the animal was opened before it was actually dying. Indeed, I may point out that in what appears to be the most successful experiment of this kind performed by RICHARDSON—p. 73 of *The cause of the coagulation*, &c., cited *supra*, p. 541—in which, after death from exposure to an atmosphere of oxygen, the right auricle of a cat was found "literally choked with a tough fibrinous mass, which was firmly adherent to the wall of the auricula." The animal was not opened until "about two hours after death," so that the experiment really affords no proof whatever that the clot was formed before the agony. FAURE—*Recherches exp. sur les caillots fibrineux et sur les produits d'inflammation du cœur*, Archives Gén.

But, although none of the foregoing circumstances can be regarded as affording satisfactory proof that the fibrin-clots found in the heart were formed before the agony, I do not doubt in the least that, under favorable conditions, such clots are actually formed at various periods before death. This belief is based upon the fact that clots are occasionally found which have undergone central softening or other degenerative metamorphoses that require considerable periods of time to effect them. To this category belong not merely globular or oval cysts, like those described by Laennec, but adherent coagula of the most diverse position and size,* whose central portion has undergone softening into a pap-like fluid of diverse appearance, in which the microscope detects nothing but granular debris and a variable number of white blood corpuscles. The time necessary to effect such changes cannot be definitely fixed, but it is probably never less than several days, and may even occupy weeks or months.

Such coagula are, however, quite rare if contrasted with the exceeding frequency of clots of recent fibrin. Still rarer must be those cases, if any such really exist, in which the clots are not merely mechanically adherent but actually united by bloodvessels to the cardiac walls. The existence of this condition would of course prove the clot to have been formed some time before death, but the observations which have been recorded invite criticism. For example, the one reported by Richardson † was probably not a mere fibrin-clot, but a true connective-tissue polypus of the heart, a rare morbid condition, which, however, occasionally occurs. I will not digress here to discuss the so-called vegetations that form upon the diseased cardiac valves, and occasionally upon other portions of the interior of the heart in certain forms of endocarditis; these are undoubtedly in many cases composed merely of fibrin, and may form at any time during the life of the patient. But the more or less bulky and firm whitish or yellowish fibrin-clots, observed so often after death from diarrhœa and dysentery, and, indeed, as will be shown hereafter, during the dissection of those dead of fever, consumption, pneumonia and other diseases, during the civil war, I am disposed to regard as having been formed in the vast majority of cases during the death agony. I am not prepared to deny that the formation of such clots may sometimes take place suddenly as a primary condition, and cause the agony instead of being caused by it; but the grounds which support the doctrine that this is a frequent accident are so far from conclusive that it must be regarded rather as an ingenious speculation than as a logical deduction from the observed phenomena.

It has more than once happened that the heart-clots found in those dead of various epidemic and endemic diseases have been supposed to be the immediate cause both of the

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de Méd., Feb., 1864, p. 129—found that fibrinous heart-clots are often formed in animals killed by an injury to the brain that does not prove immediately fatal, but if the animal was opened at the moment of death they were never so dense as when the examination was postponed to some time later. He mentions also that TARDIEU related to him that he had frequently found heart-clots in individuals dead in consequence of injuries of the head. I may add that it has long been known that heart-clots are occasionally found in those who have died a violent death in the midst of apparent health. MORGAGNI—Lib. II, Epist. XXIV, § 27—relates that before his time it sometimes happened that polypi were found in the hearts of persons killed by the sword, by clubs or by poison, and that, on judicial inquiry, the accused escaped because the polypi were affirmed by the physicians to have caused death.

* These changes in cardiac coagula have been well studied by BRISTOWE—*Softening clots in the heart*, &c., Trans. of the Path. Soc. of London, Vol. VII, 1855–6, p. 134, with an analysis of 23 cases, and *Further report on softening clots in the heart*, same Trans., Vol. XIV, 1862-3, p. 71, with an analysis of 41 additional cases. See also JOHN OGLE—*Fibrinous coagula of old standing within the cavities of the heart, which had undergone a process of softening*, &c., same Volume, p. 65, with particulars of 8 cases, in several of which the coagula were quite large.

† RICHARDSON—p. 89 of *The cause of the coagulation*, &c., cited *supra*, p. 541. A large, pear-shaped, white, movable body was found in the left ventricle of an old lady. It was adherent to a point between the segments of the mitral valve by "a fine peduncle." "The growth in question was unmistakeably, for I examined it minutely, fibrinous. It was connected with the heart at its pedunecular part by a vessel, and, throughout its structure, vessels could be distinctly traced." A wood-cut is annexed. I hope this specimen has been preserved, and that it will be again examined by some histological specialist. I suspect that it was rather fibrous than fibrinous, and suggest in comparison the cases observed by KOTTMEIER—*Fibrose Neubildung im Herzen, (Wahrer Herzpolyp.)* Virchow's Archiv, Bd. XXIII, 1862, S. 434, also Taf. IV, Fig. 3; PROUST—*Obs. d'un polype de l'oreillette droite*, &c., Gaz. Méd. de Paris, December, 1864, p. 789—who relates one case well observed by himself, and gives abstracts of five others collected from literature; and DUROZIEZ—*Mém. sur les anévrysmes du cœur*, &c., Gaz. des Hôpitaux, August, 1873, p. 804, Obs. 3—one well observed case.

morbid phenomena and the fatal issue by those who made the autopsies. To this cause Lancisius* attributed the epidemic which prevailed among horses in the vicinity of Rome in the year 1712; Huxham† explained in the same way an outbreak of suffocative catarrh which carried off some twenty sailors at Plymouth in 1742; and Chisholm‡ went so far as to name an epidemic of malignant malarial fever, which he observed at Grenada in 1790, "The Epidemic Polypus." Accordingly, it is by no means surprising that the heart-clots so often observed during the civil war were sometimes supposed to be the cause of the fatal issue. Surgeon J. R. Black§ explained in this way the cases of sudden death that sometimes occurred in the course of chronic dysentery, and Surgeon George G. Shumard,‖ applied the same interpretation to the cases of sudden death which happened in the course

* LANCISIUS—*Hist. etc., de equorum epidemia quæ Romæ grassata est toto Vere anni* 1712, Opera, Genevæ, 1718, T. II, p. 171 *et seq.*—declares the "fons mali" of this epidemic to have been an excess in the lymph of the blood, "sanguinem, lymphaticis fervidisque particulis abundantem," and the consequent tendency of that fluid to coagulate, as manifested on the one hand by the buffy coat in blood drawn from a vein, on the other by the polypi found in the heart on dissection, "plurima polyporum instar concreta corpora in cordis sinubus," p. 174. I understand LANCISIUS, therefore, to have sought the cause of this disease rather in the condition of the blood that produced the polypi than in the polypi themselves. I would point out that in one of the two autopsies appended to this essay the animal was opened four hours after death and two polypi were found in the right side of the heart; the other horse was opened while yet breathing, "altera sectio equi adhuc spirantis, * * peracta fuit," and no cardiac polypi were found, "nullum omnino in pulmonum lobis, atque in corde, cujus sinus et sanguine, et polypis vacui erant, vitium deteximus," p. 183.

† J. HUXHAM—*Diss. de polypis*, &c., in Opera Phys.-Med., Leipsic, 1773, T. III, p. 50, and Phil. Trans., abridged, Vol. IX, London, 1747, p. 135. The patients "were seized with short, importunate, asthmatic coughs, without any expectoration. Violent and almost continual palpitation of the heart, with a perpetual intermitting, trembling, fluttering pulse, and a constant anxiety, pain, and sinking of the heart." They breathed with excessive difficulty; some had pains in the side, but very little fever. Three autopsies only were made, in all of which the "polypi" were found.

‡ C. CHISHOLM—*An Essay on the Malignant Pestilential Fever, introduced into The West Indian Islands from Boullam, on the coast of Guinea, as it appeared in* 1793, 1794, 1795, *and* 1796, 2d Ed., Vol. II, London, 1801, Appendix, No. 6, "A short Account of the Epidemic Polypus at Grenada in 1790," p. 454. This disease occurred among the negroes of the plantation Grand-mal, about the end of September or beginning of October, and disappeared in November. About 40 were taken sick, of whom 7 died. It began with pain in the pit of the stomach and head, difficult respiration, depressed spirits and anxious countenance, but without fever. After about three days fever set in; pulse 120 to 140, with a penetrating, pungent heat and aggravation of all the former symptoms. The fever was intermittent, with intermissions of eight or nine hours. During the paroxysm the struggle for breath, the palpitation of the heart and other symptoms "produced a scene of uncommon horror;" death occurred chiefly during the second paroxysm. The paroxysms were each succeeded by a clammy sweat, and in several of those who recovered subcutaneous abscesses occurred. In four of the dead, polypi were found in both sides of the heart, and in one in the right ventricle only, and extending thence into the pulmonary artery. I may add that this narrative seems to have made a great impression on JOSEPH JONES—*Heart-clot*, a clinical lecture, The New Orleans Jour. of Med., Vol. 22, 1869, p. 469—who has himself "observed, carefully noted, and recorded a number of cases of malarial fever, in which heart-clots were formed before death," and arrived at the conclusion that the "formation of heart-clots during life, is very common in malarial fever."

§ Surgeon J. R. BLACK, 113th Ohio vols.—Letter to the Cincinnati Lancet and Observer, Vol. VI, 1863, p. 424—says, in speaking of the diarrhœa which prevailed in General Granger's corps during the early part of 1863: "Sudden deaths from the disease are no uncommon occurrence, and they are so sudden as to imply death from heart, or brain lesion. Post mortems have shown that the lesion is in the heart, involving deposits of fibrin on the columnæ carneæ and chordæ tendineæ. They are remarkable depositions, in some instances being from two to three inches in length, about the size of a goose quill, and larger at the free extremity than in the attached. There is no evidence in any whom I have examined, of endocarditis, and its formation is somewhat mystical. It appears from the statements of others not to be confined to diarrhœa, but to be found in nearly all classes of cases in army life. Surgeon VARIAN, U. S. V., tells me that he invariably finds it in deaths from diarrhœa." Again, Surgeon BLACK—*Camp diarrhœa*, same Jour., Vol. VII, 1864, p. 273—after relating that he had found fibrinous clots in five autopsies, "two in the left ventricle, two in the right, and one in both right and left," and describing the appearances presented with some care, adds: "Surgeon W. VARIAN, U. S. V., informed me that in a large number that he examined who died with the disease, but few were found without it. In fact he looked upon them as one of the determined pathological states of chronic diarrhœa of camp life." Surgeon BLACK adds: "I never had opportunity to examine one who died with surprising suddenness, but there is little doubt but that the death is owing to the sudden detachment of these emboli."

‖ Surgeon GEORGE G. SHUMARD, U. S. Vols.—*Heart clots in typhoid fever*. The Med. and Surg. Reporter, Vol. IX, 1862-3, p. 381—relates that "while acting as Medical Director of Huntsville, Alabama," during the summer of 1862, "a number of sudden deaths, occurring in persons considered convalescent from typhoid fever, were from time to time reported to me." "They usually fell while taking exercise, and would die in from one to five minutes after falling." No post mortem examinations were made, but after Surgeon SHUMARD became "Medical Director of the Danville District" he had several similar cases reported to him, "and they continued to recur one or more of them every week." The coagula found were "unusually tough, elastic, of a straw tint, and unmixed with coloring matter of the blood. Most of them appear to be semi-organized, though I have not thus far been able to detect vessels in them with the naked eye; but with a good glass I believe such vessels may be detected. They all appear to be composed of distinct layers, and in several of the cases I have examined, they were found attached by one or more points to the lining membrane of the heart." Surgeon SHUMARD adds: "From my own observations I am of the opinion that the formation of these coagula in the heart and arteries is of common occurrence in typhoid fever, and that in many cases they exist long before death takes place. What is known as the *'double elastic pulse'* in that disease, and which I believe is usually regarded as an unfavorable symptom, I have but little doubt is owing to this condition of the circulating system. At any rate all the cases of heart coagula that have fallen under my notice were characterized by that condition of pulse long before death." The writer speaks of "making up a box of heart specimens, with the coagula in them, for the Surgeon General U. S. A., who will, I presume, place them in the government collection." These, however, were never received at the Museum. It is somewhat amusing, in view of the experiments of RICHARDSON, (see note ‡ to p. 542, *supra,*) who found the inhalation of oxygen the surest method of producing heart-clots in animals, to learn that Surgeon SHUMARD imagined it to be the surest method of curing them in man: "I believe we have in oxygen-gas a remedy *that will prevent* the formation of coagula in typhoid fever, if administered sufficiently early in the disease." This belief was based upon experiments in which "the gas was administered to the greater number of the patients in the form *(sic!)* of *nitrous oxide*. In twelve of the cases pure oxygen was given." Surgeon SHUMARD reports that he found this treatment "most beneficial in diseases of an asthenic character, and more especially in typhoid fever, typhoid pneumonia, diphtheria, congestive measles, and erysipelas." See also, in this connection, a paper by the same author on *The inhalation of nitrous oxide gas in severe cases of fever*, Amer. Med. Times, Vol. VI, 1863, pp. 28 and 38. The views widely accepted in the army with regard to the significance of heart-clots are well illustrated by the paper of Acting Assistant Surgeon W. M. DORRAN, (Gayoso hospital, Memphis, Tenn.)—*Thrombi in cardiac cavities*, same Jour., Vol. VIII, 1864, p. 62—who groups together eight cases representing several very different pathological conditions simply because heart-clots were found in each case.

of typhoid fever. So far as I have been able to learn, these opinions were shared by very many medical officers, but I must point out that no facts were collected to show that the clots were found more frequently in the cases of sudden death than in those who died from the same diseases in the usual way, and without any symptoms pointing to the heart; nor is there any evidence that the clots in the one group of cases differed from those that occurred in the other either as to size, texture, adhesions or any other characteristics. I must, therefore, regard this supposition as a mere conjecture which is not supported by any observations actually made during the civil war.

Yet another conjecture was advanced by Salisbury, who supposed the heart-clots to be the consequence of a scorbutic taint resulting from the too exclusive use of amylaceous diet.* There is not a particle of evidence in favor of this assumption. The autopsies reported do not show that heart-clots were found during the war at all more frequently than they are in similar diseases occurring in civil life under circumstances which put the suspicion of a scorbutic taint out of the question. Nor is the assumption supported by what is known of the phenomena of scurvy, in the course of which, as we shall see hereafter, a diminution in the quantity and coagulability of the blood-fibrin is much more frequent than the opposite conditions.† It is perhaps excusable for the inexperienced observer, who for the first time enjoys the opportunity of observing numerous post mortem examinations, to indulge in speculations such as these; but the conscientious student who endeavors to acquaint himself with all the facts of the case, before forming an opinion, will regard such hasty generalizations with distrust or disapproval.

*Chemical analyses of the blood* in dysentery have been made by Masselot and Follet, Lehmann, Leonard and Foley, Artigues and Oesterlen.‡ They agree pretty well in showing a diminution in the albumen of the blood and the blood corpuscles, as might be expected from the character and quantity of the stools. With regard to the blood-fibrin the results are not accordant, in consequence probably of the circumstance that the quantity of this ingredient varies in different cases, both with variations in the character of the disease and its accompanying complications. *Microscopical examinations* of the blood, undertaken especially with reference to the presence of low vegetable organisms, have produced as yet no satisfactory result in connection with the subject of dysentery.

* J. H. SALISBURY—*Chronic diarrhœa*, &c., cited p. 373, *supra*—expresses the opinion that all the characteristic army diseases "belong to abnormal states excited by insufficient or imperfect alimentation and fermentative conditions and to a peculiar scorbutic taint, developed by the too exclusive use of an amylaceous diet. In this group of army diseases may be placed chronic diarrhœa; paralytic conditions; fibrinous depositions in the heart (Thrombosis); the clogging up of the pulmonary vessels with fibrinous clots (Embolia); the tendency to tuberculosis, loss of voice, the so called muscular rheumatism, and the majority of the diseases of the eye and ear," *op. cit.*, p. 25.

† Indeed, so frequent is the diminution of fibrin, especially in chronic scurvy, that BECQUEREL and RODIER—*Hematologie*, Gaz. Méd. de Paris, T. VII, 1852, p. 474—proposed to designate the constitutional conditions which result from this diminution by the term "état scorbutique," without reference to the causes from which it may arise in any particular case. In acute scurvy they admitted that the fibrin might oscillate between the normal limits, or even in some cases be increased; but in chronic scurvy the fibrin is constantly diminished in quantity, *e. g.*, to 1.85, 1.32, or even 1.14, per 1,000 parts, the normal proportion being from 2 to 3 per 1,000 parts.

‡ MASSELOT et FOLLET—*Mémoire sur l'épidémie dysentérique*, etc., Arch. Gén. de Méd., T. II, 1843, p. 167—concluded, from eight analyses of the blood of dysenteric subjects, that both the globules and the fibrin are diminished. The following is the mean of their observations: water, 840.288; fibrin, 1.715; globules, 99.103; albumen and fixed matters, 58.894. If a febrile reaction supervenes, however, they say the quantity of fibrin and albumen increases while the globules diminish. LEHMANN—*Physiological Chemistry*, Transl. of Cavendish Society, Vol. II, London, 1853, p. 264—says that "in dysentery the blood is poor in corpuscles. The fibrin is generally, although not always, somewhat increased. All the solid constituents of the serum are decreased, but especially the albumen. The salts, on the other hand, are considerably increased in quantity." LEONARD et FOLEY—*Rech. sur l'état du sang dans les maladies endémiques de L'Algérie*, Rec. de Mém. de Méd., de Chir., etc., Militaires, T. LX, 1846, p. 262—analyzed the blood in six cases of dysentery, in four of which they found the fibrin increased in quantity, while in two it was normal. The globules were somewhat diminished, except in one case, in which they were increased in quantity. The albumen was diminished in three cases, in the others it was not determined. They mention that during an epidemic of dysentery in September, 1841, at the military hospital at Versailles, ARTIGUES analyzed the blood in several cases and concluded that there is in dysentery a diminution of the fibrin, albumen and globules, with a corresponding augmentation of the water. OESTERLEN—*Zur Chemie der Ruhr*, Henle's Zeitschr. für Rat. Med., Bd. VII, 1849, S. 253—concludes that in consequence of the loss of albumen, &c., by the stools in dysentery, the blood becomes "poorer in albumen, fibrin and blood corpuscles, while its proportion of water increases." S. 274. But so far as the fibrin is concerned this conclusion is not sustained by the only analysis he reports, in which the result was, (S. 262.) water 831.6, fibrin 7.2, blood corpuscles 96.9; serum-albumen, 56.2; serum-salts, 8.1.

*Abdominal organs.*—Besides the cases already mentioned in which peritonitis resulted from perforation of the bowel, evidences of *general peritonitis* were observed in four of the cases of follicular ulceration, viz: 281, 316, 395 and 868; and in eleven of the undetermined cases, viz: 233, 258, 275, 409, 533, 653, 719, 735, 737, 772 and 851, to which may be added case 304, in which the peritonæum and omentum were "much injected," as representing an early stage of the same process. In one of the follicular cases, 374, a small quantity of straw-colored serum was found in the abdominal cavity. Various quantities of serous fluid were observed in nine of the undetermined cases, viz: in case 91, a "considerable quantity;" in case 80, two gallons; in case 843, half a gallon; in case 273, twenty-four ounces; in case 610, twenty ounces; in case 804, twelve ounces; in case 527, eight ounces; in case 808, five ounces; and in case 297, four ounces. In several of the foregoing cases of peritoneal inflammation and effusion a similar process coexisted in the pleural sacs and the pericardium, as, for example, in case 653. In case 781 "some peritoneal adhesions existed;" in cases 274, 389, 555 and 557 the adhesions were extensive, binding the intestines to each other, to the viscera, or to the abdominal parietes; in case 629 similar adhesions were associated with a deposit of tubercles on the peritonæum.

The *omentum* is said to have been congested in a few instances; in a few others devoid of fat; in cases 274, 646 and 727 it was almost entirely absorbed; in case 648, "completely absorbed;" in case 870 it was "contracted into a band;" in case 365, contracted and doubled up under the stomach; in case 449, adherent to the small intestine; in cases 247 and 254, adherent to the colon; in case 201, "thickened and studded with tubercles;" in case 601, transformed into "a soft gelatinous mass."

The *mesenteric glands* are very generally not mentioned. They are recorded to have been enlarged in about one-fourth of the cases. In case 647 they were "enormously enlarged and filled with a pus-like fluid;" in cases 258 and 521 they are said to have been cheesy; in cases 167, 247, 520, 771 and 778 they are said to have been tuberculous, or to have contained tuberculous deposits, by which expressions the cheesy condition was probably indicated; in cases 459 and 853 they contained calcareous deposits; in case 557 it is said that "there was an extensive deposit of tubercle in the mesentery." In case 851 a morbid growth, the nature of which was not determined, was found in the transverse mesocolon.

The *liver* is said to have been "congested" in some eight or nine of the cases of follicular ulceration and about thirty of the undetermined cases. In about half a dozen of the former and twenty of the latter class it is said to have been "soft" or "flabby." It is described as "pale" in five of the cases of follicular ulceration and rather more than a dozen of the undetermined cases; in some of these the organ was probably *fatty*. This latter condition is said to have existed in eight of the cases of follicular ulceration, viz: 145, 167, 293, 426, 505, 564, 714 and 746; and seventeen of the undetermined cases, viz: 289, 290, 308, 326, 380, 459, 568, 623, 696, 705, 736, 738, 744, 745, 747, 758 and 835. The liver is said to have presented the "nutmeg appearance" in two of the cases of follicular ulceration, 381 and 389; and six of the undetermined cases, viz: 79, 365, 441, 519, 523 and 526. In two of the cases of follicular ulceration, 138 and 139, both observed by Dr. J. Leidy, the organ is described as "rat liver," a term which, in case 139, is explained as follows: "The liver, rather small, presented the minutely mottled appearance of red and brown, which I denominate 'rat liver;' the tissue of the organ exhibited some fatty degeneration." It will be remembered that Dr. Leidy also employed the term "rat liver" in two

of the Chickahominy cases, viz: 131 and 153, in which chronic intestinal catarrh existed without ulceration.*

The liver is said to have been *large* or "enlarged," without, however, specifying its weight or any morbid appearance of its substance, in four of the cases of follicular ulceration and nineteen of the undetermined cases; in two other cases of the former class the large size of the organ is shown by its weight, which was seventy-five and a half ounces in case 401, and eighty-six ounces in case 295. So also in thirteen of the undetermined cases the organ weighed more than usual, ranging from seventy to eighty ounces in cases 228, 289, 408, 720, 737, 738, 747, 753, 810 and 842; between eighty and ninety in cases 298, 420 and 577. The liver is said to have been *small*, or its recorded weight was less than forty ounces, without any other abnormity being mentioned, in four of the cases of follicular ulceration and four of the undetermined cases; in some of these cases it was possibly cirrhosed. In one of the cases of follicular ulceration, case 196, it is said to have been cirrhosed, and weighed only twenty-seven ounces. *Cirrhosis* probably existed also in case 198, in which the organ was "firm," bronzed, and weighed only twenty-eight ounces; in case 333, in which it was firm and had a granular appearance; in case 370, in which it was of a yellowish-chocolate color internally, had well marked acini, and weighed forty-seven ounces; in case 387, in which it was firm and had well marked acini; and case 194, in which it was small and hard. Among the undetermined cases cirrhosis is said to have existed in case 794, and the liver presented a granular appearance in case 828. In one of the cases of follicular ulceration, 870, the liver was large and of a "dark bronze color."

*Abscess of the liver* was observed in five of the cases of follicular ulceration, viz: in case 195 the right lobe of the liver was adherent to the diaphragm and contained a large single abscess which held about a quart of gray odorless pus; in this case there were also a number of small metastatic abscesses in the lungs; in case 872 there was a large single abscess in the right lobe of the liver, and hard nodules, probably metastatic foci, existed in the spleen, [Nos. 971 and 972, Med. Sect., Army Med. Museum, are from this case;] in case 878 there was also a large single abscess in the right lobe of the liver, which had discharged into the intestinal canal by two openings, one in the duodenum, the other in the ascending colon; extravasation of the intestinal contents was prevented by previously formed adhesions, [Nos. 1149 and 1150, Med. Sect., Army Med. Museum, are from this case;] in case 902 there was a large abscess in the right lobe of the liver, which communicated with the pleural cavity through an opening in the diaphragm; in case 201 the liver was bound by peritoneal adhesions to the abdominal parietes; on section it was dark-red, and "contained a large number of saccules, which varied from the size of a grape-seed to that of a bean, and contained a semi-fluid granular matter."

Abscesses were also observed in eleven of the undetermined cases, viz: in case 405 a single abscess the size of a large hen-egg in the right lobe; and in case 578 a large single abscess, (probably in the right lobe,) which contained about a quart of pus and projected on the under surface of the liver; multiple abscess or metastatic foci were observed in case 375, in which the liver contained a number of purulent deposits; in case 393 "the liver was hard and presented a number of whitish lardaceous spots," and "a number of lobules in the left lung were hepatized gray," I interpret these expressions as descriptions of metastatic foci; in case 407 the left lobe of the liver "was entirely destroyed by abscesses,"

* See p. 316, *supra*.

and its right lobe contained two others, "one about the size of a goose-egg, the other about the size of a hen-egg;" in case 449 the liver contained about twenty small abscesses varying in size from that of a pea to that of a walnut; in case 619 the liver contained twelve distinct abscesses varying from the size of a walnut to that of a goose-egg: one of them had discharged through the diaphragm and adherent right lung into the bronchial tubes; in case 727 "the lungs, liver and spleen were filled and covered over with small light-yellow masses about the size of mustard-seeds or rather larger; these had the appearance of tubercles, were of firm consistence, and were closely adherent to the adjacent tissue; they were more abundant in the liver and spleen than in the lungs, and were more numerous on the surface than through the substance of the organs;" these, I doubt not, were really metastatic foci; in case 728 the liver contained a few small purulent collections; in case 762 it contained numerous small circumscribed collections of a pus-like fluid; finally in case 781 the liver was large, and presented on its upper surface "a number of yellowish spots the size of a dime," which were probably metastatic foci.

Including the cases of both classes, we have six instances of single hepatic abscess and ten of multiple or metastatic abscesses out of three hundred and ninety-six cases of chronic intestinal ulceration, so that hepatic abscess can be said to have existed in only about four per cent. of these cases.

Reviewing now the facts previously given with regard to the occurrence of hepatic abscess in other forms of flux, it will be remembered that of 156 cases of acute or chronic catarrhal inflammation of the intestinal mucous membrane without ulceration, there was but one case of this complication, viz: case 171, in which two large multilocular abscesses were found in the liver,* while in 115 cases of diphtheritic dysentery there were three of single abscess and four of multiple metastatic foci.† Adding together these figures, we shall have fourteen cases of multiple abscess and nine of large single abscess occurring in five hundred and eleven cases of flux in which the intestine was ulcerated, and but a single case of (large) hepatic abscess occurring in one hundred and fifty-six cases of flux in which the intestine was not ulcerated. There is one other case of multiple abscess of the liver reported in the previous section, viz: case 822, in which the patient is said to have died of "chronic diarrhœa," but no evidences of disease were discovered in the intestines.‡ It will hence be seen that our experience on this subject corresponds rather with that of medical observers in Great Britain and continental Europe than with that of Europeans in tropical countries.

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* See p. 316, *supra*. † See p. 459, *supra*.

‡ In addition to the cases thus summarized, two specimens of abscess of the liver from dysenteric subjects, which are preserved in the Army Medical Museum, may be mentioned. The first is No. 668, Medical Section: The patient was a soldier, 41 years old, who had suffered from "chronic diarrhœa" for several months, and died at Fort McHenry, Maryland, October 21, 1865; three abscesses, each containing about 4 ounces of pus, were found in the right lobe of the liver; the colon was ulcerated throughout; some of the ulcers were very large and had penetrated to the muscular coat. The second is No. 1294, Medical Section: The patient was a citizen, 63 years old, recently convalescent from dysentery, who died at San Antonio, Texas, November 23, 1874; an abscess containing a quart of pus was found in the right lobe of the liver, and the cicatrices of dysenteric ulcers were detected in the ascending and transverse colon. There is still a third specimen in the Museum, No. 447, Medical Section, from a colored corporal, who is said to have suffered from diarrhœa several times during the six months preceding his death, and who died at L'Ouverture hospital, Alexandria, October 8, 1864; the right lobe of the liver contained a number of small abscess cavities, but no appearance of ulceration could be detected in either the large or small intestine; in the catalogue—*Catalogue of Medical Section*, Washington, 1867, p. 92—it is erroneously stated that "the condition of the intestinal mucous membrane was, unfortunately, not recorded;" the letter of transmittal contains the statement made above, which was overlooked in preparing the catalogue. It may be added that this man was admitted to L'Ouverture hospital, August 9, 1864, with slight flesh wounds on the hand, side and hip, received from fragments of shell; we are told, however, that by September 12th his wounds had "healed without difficulty." It seems improbable, therefore, that the liver abscess was due to the wounds. The Museum also contains nine other specimens of abscess of the liver in which this lesion was unconnected with dysentery, viz: specimens Nos. 295, 501, 669, 742, 850, 1068, 1099, 1129 and 1316. Moreover, eight specimens of hepatic abscess were received at the Museum during and since the war which were not preserved, either on account of the condition of the specimens when received, or the imperfect character of the record transmitted with them. In two of these cases, one a soldier, the other a colored woman, dysentery is said to have preceded the abscess-formation, but there is no record of the post mortem condition of the alimentary canal. The other six cases were unconnected with dysentery. An account of all these cases will be presented hereafter.

A summary of the chief facts with regard to this experience may be advantageously presented in this place. Nowhere has the complication of dysentery by liver abscess attracted greater attention or been made the subject of more numerous studies than by the British physicians in India. Ballingall* found liver abscess in 4 out of 35 autopsies of fatal dysenteries, made from 1808 to 1814. The splendid work of Annesley† contains an account of 51 such autopsies, in 26 of which liver abscess was found. To this enormous proportion it may be objected that these were chiefly cases selected to illustrate the subject of hepatitis, and hence give an undue prominence to this complication; but this objection cannot be urged against the statistics of Waring,‡ who has collected, from the reports of various regiments in the Madras Presidency, 259 autopsies on dysenteries made from 1826 to 1843, in 69 of which liver abscess was observed; and similar results have been more recently obtained by Eyre,§ who found liver abscess in 27 out of 118 autopsies among the 1st Madras fusiliers, and Ranking,‖ who found it in 41 out of 140 autopsies in the 2d Madras European light infantry. Neglecting the figures of Annesley for the reason stated, the sum of the others will represent the occurrence of hepatic abscess in about one of every four fatal cases of dysentery. Moore¶ has tabulated 494 fatal cases of dysentery observed in the European general hospital at Bombay, in 90 of which liver abscess was found, or

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* GEORGE BALLINGALL—*Pract. Obs. on Fever, Dysentery and Liver Complaints as they occur amongst the European Troops in India*, Edinburgh, 1818, p. 59.

† JAMES ANNESLEY—*Diseases of India*, London, 1828. I give the figures as stated by MACPHERSON—p. 49, *op. cit., infra*—and others.

‡ E. J. WARING—*An Enquiry into the Statistics and Pathology of some points connected with Abscess in the Liver as met with in the East Indies*, Trebandrum, 1854, p. 120. The figures in the text embrace those reported by SHANKS, Madras Med. Jour., Vol. I, 1839, p. 258; INNES, same Jour., Vol. VI, p. 172; MOUAT, same Jour., Vol. II, p. 9; HAMILTON, same Jour., Vol. IV, p. 318; DIX, same Jour., Vol. V, p. 214; THOMPSON, same Jour., Vol. V, p. 16; and MCGREGOR, same Jour., Vol. II, p. 376. [I have only been able to verify a part of these references, the files of this journal in the Library of the Surgeon General's Office being incomplete.] WARING'S table also includes MACPHERSON'S Calcutta cases and 81 fatal cases of dysentery, in 31 of which hepatic abscess was found, observed by MOREHEAD and STOVELL in the European general hospital, Bombay. Altogether, these make up 633 fatal cases of dysentery, in 149 of which hepatic abscess was found; and these are the figures usually attributed to WARING. I may add that the work of this author, although rudely printed, is a mine of information for the serious student of this subject, not merely because it contains abstracts of numerous cases, but because references are so generally given to the original authorities.

§ E. W. EYRE—*Medical notes on dysentery*, Indian Annals of Med. Science, October, 1855, p. 56. These figures represent the experience of the 1st Madras fusiliers from 1834 to 1851, with a few additional cases.

‖ J. L. RANKING—*Statistical gleanings from the records of the 2nd Madras European light infantry for the years 1840–1860, inclusive*, Madras Quarterly Jour. of Med. Sci., Vol. VII, 1863, p. 47.

¶ W. J. MOORE—*The relation of dysentery to abscess of the liver as shown by the clinical records of the European general hospital, Bombay*, Trans. of the Med. and Phys. Soc. of Bombay, No. VIII, N. S., 1862, p. 292; also Annals of Military and Naval Surgery, Vol. I, London, 1864, p. 226. The table given by this author includes, besides statistics cited from various authors, a number of cases observed by himself in the hospital named, as well as those observed in the same hospital by MOREHEAD, STOVELL and LEITH, as shown in the following abstract:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MOREHEAD | No. of deaths of dysentery | | | 30 | Hepatic abscess in | | | 12 |
| STOVELL | " | " | " | 129 | " | " | | 25 |
| LEITH, one year | " | " | " | 47 | " | " | | 4 |
| LEITH, several years | " | " | " | 92 | " | " | | 14 |
| MOORE | " | " | " | 196 | " | " | | 35 |
| Total | | | | 494 | | | | 90 |

The original report of MOREHEAD—*Cases illustrative of the pathology of the diseases of Bombay, Part III*, Trans. of the Med. and Phys. Society of Bombay, No. 7, 1844, p. 56 *et seq.*—contains 32 autopsies of subjects dead of dysentery, cases 145 to 176 inclusive, in 13 of which hepatic abscess was found. WARING (*op. cit.*) quotes the figures correctly. Why MOORE has modified them I do not know. STOVELL'S figures are given in his "*Statistics of more important diseases admitted into the European general hospital during 10 years*," same Trans., 1855–57, which I have not been able to see. Of these figures those for 1847, 1850–51 and 1851–52, in all 49 cases, with 21 hepatic abscesses, are included in WARING'S figures. Supposing MOORE has cited STOVELL correctly, I have a difficulty in understanding the figures he assigns to LEITH. This gentleman, A. H. LEITH—*Annual report of the European general hospital for the year* 1858–59, same Trans., No. 5, N. S., 1859, p. 89—states that if all the cases of dysentery, with and without hepatic abscess, "that have occurred in this hospital during the last three years be added to those given in Dr. STOVELL'S Decennium of the Hospital Statistics, recorded in the Transactions of the Medical and Physical Society, 1855–56, there will be the aggregate of: Dysentery without hepatic abscess 188, dysentery with hepatic abscess 50." That is 50 hepatic abscesses in 238 cases of dysentery. Subtracting STOVELL'S figures, as cited by MOORE, from these, we shall have 109 cases with 25 hepatic abscesses for the three years' observations of LEITH, instead of those given by MOORE. LEITH'S *Annual report of the European hospital for* 1859–60, same Trans., No. VI, N. S., 1860, p. 217, shows that year 47 cases of dysentery with but 4 hepatic abscesses: this is correctly cited by MOORE. The files of the Transactions cited, in the library of the Surgeon General's Office, are very incomplete, and although, through the great kindness of Sir Joseph Fayrer, I was favored with the loan of seven volumes belonging to the library of the Secretary of State for India, this set was deficient in several volumes. I regret this circumstance the more because MOORE (whose statistics have been praised by AITKEN—*Science and Practice of Medicine*, 3d Amer. Ed., Philadelphia, 1872, Vol. II, p. 649) has duplicated figures in some parts of his table in a manner that throws doubts on the remainder. Thus he ascribed to MACPHERSON 160 cases, to MOREHEAD 30, to STOVELL 129 and to WARING 63, without appearing to know that WARING'S figures include all the cases ascribed to MACPHERSON and MOREHEAD and 49 of those of STOVELL. I may add that MOORE in the same table, ascribes to MACNAMARA 51 fatal cases of dysentery with 26 examples of hepatic abscess, which figures suspiciously resemble those of ANNESLEY, [see note, *supra*.] I can hardly believe, however, that MOORE has duplicated or seriously misstated the figures of his own hospital, and therefore, in the absence of some of the original documents, accept his summary of the results of that institution.

about once in every five and a half deaths. Macpherson,* in his essay on Bengal dysentery, tabulated 293 autopsies made in the Calcutta hospitals, in 46 of which liver abscess was found, or about one in six and a half deaths. Chuckerbutty† has since reported 39 autopsies, also made at Calcutta, in only 3 of which liver abscess existed, or once out of thirteen deaths. Parkes,‡ at Moulmein, in Burmah, found a larger proportion. In 25 autopsies on cases of acute dysentery he found 7 instances of liver abscess, while Taylor,§ during the Burmese war of 1852–3, in 53 such autopsies found 8 instances of liver abscess. The results of the two observers combined represent the occurrence of hepatic abscess in Burmah once in every four and a half deaths from dysentery. In Ceylon, Marshall || had a similar experience; in 177 autopsies on dysenterics he found liver abscess 43 times, or about once in four deaths.

In Cochin China, two of the French physicians, Bourgarel and Gayme,¶ obtained similar results; they found liver abscess in 13 out of 52 autopsies of dysenterics, or once in four deaths. On the other hand, Julien,** in 108 such autopsies only found liver abscess in 8 instances, or once in thirteen and a half deaths. In Algeria the reports of the French physicians show the frequency of this complication to be nearly as great as in India. Catteloup,†† at Tlemcen, found liver abscess in 47 of 240 autopsies of dysenterics, while Vital, at Constantine, as reported by Mouret,‡‡ found it in 133 of 761 autopsies.

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* JOHN MACPHERSON—*On Bengal dysentery*, Calcutta, 1850. The figures in the text are made up as follows:

| | | | | | |
|---|---|---|---|---|---|
| General hospital, Calcutta, | Acute dysentery | No. of deaths of dysentery | 160 | Hepatic abscess in | 21 |
| " " " | Chronic " | " " " | 55 | " " | 6 |
| Seamen's hospital, " | Dysentery | " " " | 24 | " " | 5 |
| Medical College hospital, Calcutta, | Dysentery | " " " | 54 | " " | 14 |
| | | Total | 293 | | 46 |

† S. G. CHUCKERBUTTY—*Cases illustrative of the pathology of dysentery*, Indian Annals of Med. Sci., No. XIX, 1865, p. 90.

‡ E. A. PARKES—*Dysentery and Hepatitis of India*, London, 1846, p. 39. It must be remembered that these figures were derived from picked cases of acute dysentery only.

§ J. R. TAYLOR—*Annual medical report of H. M. 80th regiment for the year ending March* 31, 1853, Indian Annals of Med. Sci. for April, 1854, pp. 395 and 404. Mr. STEWART, who accompanied the 18th Royal Irish in the same war, remarks (*ib.*, p. 434) that in fully three-fourths of the fatal cases of dysentery the liver was found "more or less implicated, from simple engorgement to abscess." On the other hand, in the first Burmese war, 1824–25, WADDELL—*Diseases, &c., among the British troops at Rangoon*, Trans. of Med. and Phys. Society of Calcutta, Vol. III, p. 254—did not find organic disease of the liver in any of the cases of dysentery which he dissected.

|| HENRY MARSHALL—*Notes on the Med. Topography of the interior of Ceylon*, London, 1821. The statement in the text is deduced from the tables on pp. 94, 106, 115 and 123, which refer to the years 1817–20 inclusive. During the same time among the native troops, in 70 autopsies on dysenterics, liver abscess was found 6 times. I may remark that CAMERON—*Extracts from the annual report on the health of the troops serving in Ceylon from April* 1, 1850, *to March* 31, 1851, Med. Times and Gaz., Vol. VII 1853, p. 366—asserts that Ceylon dysentery is "very rarely attended with that hepatic complication so much talked of elsewhere." On how many autopsies this opinion is based, if any, does not appear. It would be easy to multiply observations from various parts of India, but those cited are sufficient to show the frequency of the complication in question. Among the older observations I may refer to the case of BONTIUS, cited in note ‡ to p. 394, *supra*, and to two cases of dysentery, in which multiple abscesses were found in the liver, reported by STEPHEN MATHEWS—*Obs. on Hepatic Diseases incidental to Europeans in the East-Indies*, London, 1783, p. 202 *et seq.*, (cases 2 and 3.)

¶ A. CH. AUG. BOURGAREL—*De la dysenterie endémique dans la Cochinchine Française*, Montpellier Thesis, 1866, No. 100, p. 32—observed abscess of the liver 7 times in 22 autopsies of dysenteries, while J. B. L. GAYME—*De la dysenterie endémique dans la Basse-Cochinchine*, Montpellier Thesis, 1866, No. 10, p. 50—found liver abscess 6 times in 30 autopsies on dysenterics.

** CH. M. JULIEN—*Aperçu sur les lésions anatomiques de la dyssenterie en Cochinchine*, Montpellier Thesis, 1864, No. 62, p. 54.

†† CATTELOUP—*Recherches sur la dyssenterie du nord de l'Afrique*, Recueil de Mém. de Méd., etc., Militaires, T. VII, 2me Série, 1851, p. 89:

| | | |
|---|---|---|
| " Dyssenteries | 1,545 | } non terminées par la mort. |
| Hépatites | 54 | |
| Décès | 240 | |
| Abcès du foie | 47 cas. | } après vérification nécroscopique." |

These figures are seldom quoted; those usually given in the text-books are contained in a former article, viz: *Mémoire sur la coïncidence de l'hépatite et des abcès du foie avec la diarrhée et la dysenterie, endémiques dans la province d'Oran*, same Journal, T. LVIII, 1845, p. 30, in which hepatic abscess is said to have been found in 20 of 157 autopsies of subjects "about two-thirds of whom had died of diarrhœa or dysentery." These are the figures cited by MOORE and AITKEN (see note ¶, p. 549, *supra*) as the experience of the "French surgeons in Algeria."

‡‡ A. MOURET—*De la coïncidence de l'hépatite ou des abcès du foie avec la dysenterie, dans les pays chauds*, Paris Thesis, No. 52, 1853, p. 7. These autopsies were made by VITAL between 1841 and 1851. In 589 instances the lesions of dysentery existed without hepatic complication; in 133, liver abscess coexisted with dysentery; in 20, cirrhosis; in 4, atrophy; in 10, induration; and in 5, tubercles. The frequency of liver abscess in the dysentery of Algeria is affirmed in a general way by HASPEL—*Maladies de l'Algérie*, Paris, T. II, 1852, p. 87, and ARMAND—*L'Algérie Médicale*, Paris, 1854, p. 347. It is also indicated by the fact that HASPEL—*Mémoire sur les abcès du foie*, Rec. de Mém. Méd., etc., Militaires, T. LV, 1843, p. 1—reports eleven autopsies on cases of hepatic abscess, in eight of which there had been diarrhœa or dysentery, and ulceration of the large intestine was observed; and that according to ROUIS—*Recherches sur les Suppurations Endémiques du Foie*, Paris, 1860—of 203 cases of hepatic abscess observed in Algeria, 179 were preceded or accompanied by dysentery; the mortality of the complicated cases being about twice as great as that of the uncomplicated ones—p. 147, *et seq.* On the other hand, CAMBAY—*Traité des Maladies des Pays Chauds et spécialement de l'Algérie*, Paris, 1847, p. 211—affirms that hepatic disease only occurs in one case of dysentery out of twenty in Algeria: "Cette complication d'hépatite survient à peu près, d'après les observations que nous avons faites dans ce pays, dans le vingtième des cas de dysenterie."

The two series combined represent the occurrence of liver abscess once in every five and a half deaths from dysentery. The observations of De Castro* show that it is also a very common complication among Europeans in Egypt.

Our information with regard to its frequency in the tropical regions of America is less complete. Sigaud has testified to its common occurrence in the dysentery of Brazil; Y Romay to its frequency in Cuba; Murillo states that it was observed in 21 of 70 autopsies on dysenteries in Chili; Van Archen has testified to the frequency of hepatic abscess in Venezuela, and Mears and Ramirez to its frequency in Mexico, without, however, emphasizing its connection with dysentery.†

These statistics indicate the frequency with which liver abscess complicates dysentery among Europeans in tropical climates.‡ That it is much less common among the natives of these countries appears from the testimony of Marshall in Ceylon; Annesley, Twining and Parkes in India; Griesinger in Egypt,§ and many other observers.‖ That it is possible

* S. V. De Castro—*Des Abcès du Foie*, etc., Paris. 1870. According to this writer in the European hospital of Alexandria, Egypt, where the patients are chiefly Italian and French, abscess of the liver occurred in the proportion of 1.04 per cent. of the cases, p. 5, and dysentery in the proportion of 7.52 per cent., while in the Greek hospital at the same place, abscess of the liver occurred in 1.98 per cent., and dysentery in 15 per cent. He does not give the numerical proportion of the liver abscess coexisting with dysentery, but remarks that dysentery often precedes the formation of hepatic abscess, and that the greater frequency of dysentery is probably one reason of the greater frequency of hepatic abscess in the Greek hospital, p. 9. On the other hand, he states that among the Arabs abscess of the liver is exceptional, p. 6. The remark of L. Frank—*De Peste, Dysenteria et Ophthalmia Ægyptiaca*, Vienna, 1820, p. 187—with regard to the post mortem appearances which he observed in the bodies of French soldiers dead of dysentery in Egypt, may also be cited as interesting in this connection: "Dum cadavera hoc morbo defunctorum aperirentur, inveniebantur in abdomine variæ mutationes, frequenter deprehendebantur signa inflammationis intestinorum, exulcerationes, et quandoque maculæ gangrænosæ; interdum reperiebantur etiam in hepate majores minoresve abscessus."

† J. F. X. Sigaud—*Du Climat et des Maladies du Brésil*, Paris, 1844, p. 337. He regarded both the hepatitis and the dysentery as due to the same cause as intermittent fevers, and believed that hepatitis was the primary disorder and dysentery its consequence. Manoel-José Villela wrote to Broussais that diseases of the liver were more common in Brazil than diseases of the lungs in France: Broussais—*Hist. des Phlegmasies*, 3me Édit., Paris, 1822, T. III, p. 276. E. N. Y Romay—*Étude des abcès du foie dans la dysentérie chronique*, Paris Thesis, 1872, No. 216. The material for this thesis is collected from European sources, but the author remarks at the outset, p. 5: "J'ai choisi pour sujet de ma thèse inaugurale l'étude des abcès du foie dans la dysentérie chronique, maladie très-fréquente dans mon pays, l'île de Cuba." A. Murillo—*Contribuzione allo studio della epatite suppurativa del Chile*. Rivista Clinica di Bologna, 1875, p. 331; Dr. E. Rodriguez is credited with 23 of these autopsies, in 11 of which liver abscess was found, and Dr. Letelier with 47, in 10 of which liver abscess occurred. I learn from a paper by Olof Page, of Valparaiso, Chili—*Case of hepatic abscess*, Amer. Jour. of the Med. Sci., October, 1876, p. 423—that Murillo's contribution was originally published in Chili in the Revista Medica, which I have not access to. Page himself affirms that this complication of dysentery only occurs in Chili among individuals addicted to drink; no statement in proof of which he brings forward no statistics. G. Van Archen—*Hepatitis in the tropics*, American Medical Monthly, Vol. VII, 1857, p. 25. The author affirms that "the disease which annually carries off at least half the number of those that die [in Venezuela] is chronic hepatitis, which either proceeds to induration or suppuration, forming enormous abscesses." J. H. Mears—*Case of hepatic abscess*, &c., Med. and Surg. Reporter, Vol. XXXI, 1874, p. 84—speaks of the frequency of hepatic abscess at Monterey. L. Ramirez—*Du Traitement des Abcès du Foie*, Paris, 1867—also speaks of it as a frequent disease in Mexico, and lauds the operative procedures of Prof. Jimenez. Neither of these writers gives statistics.

‡ The statistics of the detachments of the armies of Great Britain and France in the various colonies of those Powers give interesting facts with regard to the prevalence of dysentery and "hepatitis" among European troops in numerous localities. Those relative to the British army will be found in the *Statistical Reports* of Major A. M. Tulloch, London, 1838–41, and of late years in the *Army Medical Department Reports*; a summary of those relating to the French colonies will be found in the work of A. F. Dutroulau—*Traité des Maladies des Européens dans les Pays Chauds*, Paris, 1868. The statistics collected by Dutroulau give the number of cases of dysentery and of hepatitis reported, but do not show the number of cases of hepatic abscess, or even how often the condition, reported as hepatitis, occurred as a complication of dysentery. The same statement is true of the earlier English *Army Medical Department Reports;* their statistical tables reported the number of cases of hepatitis acuta and h chronica occurring in each command, but had no heading for hepatic abscess. Of late years this has been changed, and a separate heading for hepatic abscess has been introduced; from which, however, the frequency of its occurrence as a complication of dysentery cannot be ascertained. The statistics of our own army also, until very recently, had no heading for hepatic abscess. Acute and chronic hepatitis are reported separately in the statistics of Coolidge and in the First Medical Volume of this work. Cases of hepatic abscess which occurred independently of dysentery were generally embraced under the latter head, in which also various other chronic hepatic disorders were no doubt included. Those cases which occurred during the progress of dysentery were usually reported simply as dysentery. So that it is only from the special reports of cases, and especially the reports of post mortem examinations, that the frequency of this complication in the dysentery of our army can be ascertained.

§ It has already been mentioned (see note to p. 550, *supra*) that Marshall found 6 examples of liver abscess in 70 autopsies on dysentery among the native troops in Ceylon, or once in 11½ deaths, while among the Europeans, in the same district and during the same time, he observed it once in every four deaths. Annesley states that he seldom found the liver diseased among natives who died of fluxes in Madras—*Diseases of India*, London, 1828, Vol. II, p. 350. Wm. Twining—*Diseases of Bengal*, 2d Edit., Calcutta, 1835, Vol. I, p. 50: "Moreover, dysentery is observed to be very frequent and very fatal among the natives of Bengal, while affections of the liver are exceedingly rare among these people." Parkes—*Dysentery and Hepatitis of India*, London, 1846, p. 118: "And, lastly, in Asiatics, in whom for weeks together there are often purulent stools to a great amount, and of the most decided character, abscess of the liver is so uncommon, that in a great number of dissections of dysentery I have never found it." W. Griesinger—*Krankheiten von Egypten*, Archiv für Phys. Heilkunde, 1854, S. 530 and 541—in 186 autopsies, chiefly of native Egyptians dead of dysentery in hospital near Cairo, found but two examples of liver abscess.

‖ Compare, for example, the relative frequency of hepatitis among English and native troops in the British statistical reports [see note *supra*] and the remarks of Dutroulau [*op. cit.*] on the diseases of the natives in the French colonies. Hirsch—*Hist.-Geog. Path.*, Erlangen, 1860–4, Bd. II, S. 312—somewhat sweepingly asserts that "all observers agree that hepatitis is prevalent among the Europeans, much rarer among the negroes, and rarest among the Asiatics." The most important fact cited in favor of this view is from Tulloch—*Statistical Reports on the Sickness, &c., among Her Majesty's Troops serving in Ceylon*, &c., London, 1841—who reports 4.9 deaths of hepatitis per 1,000 of strength annually among the European; 3.2 among the negro; and a "mere fraction" among the Asiatic troops serving in Ceylon; [the statistics cover 20 years for the European troops, from 1817–36 inclusive, and shorter times for the others.]

for Europeans to become so acclimated as to attain a degree of immunity similar to that enjoyed by the natives would appear to be exceedingly problematical.* In more temperate regions this complication of dysentery is comparatively rare. On the Chinese coast Wilson observed but two examples of hepatic abscess in 61 autopsies on dysenterics, and Traquair states that in a number of such autopsies made at Hong-Kong he did not encounter it in a single instance.†

In Europe the infrequency of liver abscess in dysentery has been abundantly demonstrated by numerous observations. It does, however, occasionally occur in both acute and chronic cases. Broussais has related the particulars of 17 cases of diarrhœa and dysentery, in none of which liver abscess was observed; Rokitansky, in his essay on the dysenteric process, declared that he had never encountered this complication; Baly asserted that it did not exist in one of the many hundreds of cases of dysentery which he observed in the Millbank prison; nor did Finger find a single example of it in the 231 autopsies on dysenterics he made in the hospital at Prague. During the Crimean war Lyons found but one instance of hepatic abscess in 51 autopsies on dysenterics, and Savignac declared that although he had seen a great number of cases of chronic dysentery in the French hospitals, none of them suffered from suppuration of the liver.‡ On the other hand, Cheyne found four examples of hepatic abscess in 30 autopsies on subjects dead of dysentery, in Dublin, during the epidemic of 1818. Louis and Andral have each related a case in which hepatic abscess supervened upon a chronic flux dependent upon intestinal ulceration. Marston, in 48 autopsies on subjects dead, at Malta, of dysentery contracted in the Crimea, found two examples of hepatic abscess. Bristowe found at St. Thomas's hospital, London, four examples in 32 autopsies in which dysenteric ulcers existed in the intestine; and Bergès§ has collected eight examples of hepatic abscess consecutive to dysentery, observed in Paris by

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* Exact statistics on this subject are much to be desired. See the discussion of the question by HIRSCH—*op. cit.*, Bd. II, S. 314—who concludes that, so far as the facts are known to him, they show that no immunity results from prolonged residence in the tropics. DUTROULAU—*op. cit.*, p. 176—holds the same opinion: "En résumé, pas plus d'acclimatement contre la dysenterie et l'hépatite que contre la fièvre," and W. J. MOORE—*Health in the Tropics*, London, 1862, p. 277—emphatically exclaims: "The fact is, for the white man or his offspring there is no such thing as acclimatization in India."

† JOHN WILSON—*Medical Notes on China*, London, 1846. I have not seen this work, and quote from WARING—p. 121, *op. cit.*, note ‡, p. 549, *supra*; see also a rather full notice of it in the Med.-Chir. Review, Vol. IV, 1846, p. 73. TRAQUAIR—*Dysentery as met with in Hong-Kong*, Med. Times and Gaz., Vol. I, 1854, p. 335.

‡ BROUSSAIS—*Hist. des Phlegmasies*, 3me Édit., Paris, 1822, T. II, p. 517 *et seq.*, Obs. X to XXVII, inclusive. Nevertheless BROUSSAIS believed that hepatitis was always due to a pre-existing gastro-entérite, and held to this view so exclusively that he explained the hepatic abscesses which sometimes follow cranial wounds by the aphorism, "les encéphalites produisent toujours la gastro-entérite, et quelquefois l'hépatite."—T. III, p. 268. See also Proposition de Pathologie, No. 149, "L'hépatite est consécutive à la gastro-entérite, quand elle ne dépend pas d'une violence extérieure"—*Commentaires des Prop. de Path.*, T. I, Paris, 1829, p. 287; CARL ROKITANSKY—*Der dysenterische Prozess*, Oest. Med. Jahrb., Bd. XX, 1839, S. 93: "Eine augenfällige Erkrankung der Leber, wie solche bey den Ruhren in den Tropenländern vorkommen soll, haben wir nicht gefunden;" WM. BALY—*Gulstonian lectures*, London Med. Gazette, Vol. IV, 1847, p. 488; FINGER—*Die epidemische Ruhr*, Prager Vierteljahrschrift, Bd. IV, 1849, S. 145; R. D. LYONS—*Report on the Pathology of the Diseases of the Army in the East*, London, 1856, p. 30 *et seq*; J. D. DE SAVIGNAC—*Traité de la Dysentérie*, Paris, 1863, p. 173.

§ J. CHEYNE—*Dysentery as it appeared in* 1818, Dublin Hospital Reports, Vol. III, 1822, p. 1. The cases in which liver abscess was observed are Nos. 6, 18, 27 and 28. CHEYNE himself remarks, p. 36, of the liver, "in two cases there were abscesses formed in its substance," a misstatement or misprint which is often quoted, *e. g.*, by J. W. BEGBIE, in Reynolds' System of Medicine, Vol. III, London, 1871, p. 144. P. CH. A. LOUIS—*Mémoire sur les abcès du foie*, Rech. Anat.-Path. sur Diverses Maladies, Paris, 1826, p. 351. This memoir contains five cases of hepatic abscess: the one referred to is Obs. 3, a medical student who had long suffered with diarrhœa; multiple abscesses of the liver and follicular ulcers of the large intestine were found on the autopsy. G. ANDRAL—*Clinique Médicale*, 3me Édit., Paris, 1834, T. II, p. 464; I refer to Obs. 25, a case of "gastro-entérite chronique," in which on the autopsy the liver was found to contain a single abscess about the size of an orange, and numerous ulcers were found in the lower part of the ileum and in the cæcum. The work cited contains the particulars of eleven other cases of hepatic abscess, making twelve in all, viz: one on pp. 319–321, and eleven between p. 449 and p. 497. I note that FRERICHS—*Diseases of the Liver*, New Sydenham Society's Transl., Vol. II, London, 1861, p. 102—remarks: "Of 16 observations collected by Louis and Andral, ulcers were present in only 3, and in 2 of these cases the ulcers were tubercular." ANDRAL himself, however, counts 17 cases, as I do: "Les onze cas qui vont être rapportés, réunis aux cinq relatés par M. Louis, et à un autre que nous avons déjà rapporté plus haut dans ce volume," &c., (*op. cit.*, 449.) Now I am quite clear that the case just cited from LOUIS is not one of tubercular ulceration; about the case cited from ANDRAL, I am not so sure. There were a few "crude" tubercles in the upper part of the lungs in this case, but the description of the ulcers is not very definite. If they were tubercular ulcers, this case might be cited as adverse to the observation of BRISTOWE [*vide infra*] that abscess of the liver did not coexist with tubercular ulcers of the intestine. FRERICHS (*loc. cit.*) remarks further, of his own experience, that of 8 cases of hepatic abscess observed by him, intestinal ulcers did not exist in any. J. A. MARSTON—*On dysentery, a paper compiled from fatal Crimean cases, observed at Malta military hospital*, Med. Times and Gazette, Sept. 20, 1856, p. 284. J. S. BRISTOWE—*On the connection between abscess of the liver and gastro-intestinal ulceration*, Trans. of the Path. Soc. of London, Vol. IX. 1857–8, p. 241. This paper contains an analysis of the records of 324 autopsies in which ulcers or cicatrices were observed in the gastro-intestinal mucous membrane; of these, 45 were specimens of typhoid, and 25 of malignant ulcera-

various physicians. According to Heubner,* it is chiefly multiple or embolic abscess of the liver which is observed in European dysentery, and it occurs chiefly in connection with periproctitic inflammation.

Even in cases of chronic dysentery contracted in tropical climates, and proving fatal after their return to England or France for treatment, abscess of the liver is comparatively rare. Knox found but two examples in 64 such cases observed in Edinburgh, and Roullet but two in 50 autopsies of colonial dysentery recorded at the marine hospital of Rochefort, from 1821 to 1869. According to Ward, hepatic abscess does not occur in five per cent. of the cases of well marked and severe dysentery treated at the seaman's hospital, London.†

When, now, the attempt is made to compare the experiences thus summarized with what occurs in the United States in time of peace, the absence of adequate statistics for the purpose must certainly be regretted. Brokaw had the extraordinary experience of finding hepatic abscess in 22 out of 27 autopsies of dysenteric subjects at the marine hospital, St. Louis, Missouri; and Fox, at the quarantine hospital of the same city,‡ observed it in 5 of 30 autopsies of subjects dead of chronic diarrhœa and dysentery; but these results are not supported by the observations of others. I find in the American medical journals and transactions more or less detailed reports of only about 150 cases of hepatic abscess reported prior to 1876, including alleged cures and traumatic cases. In less than one-fourth of these does the record indicate any connection with dysentery, and in but 21 is this connection supported by post mortem examination.§

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tion; in none of them did hepatic abscess coexist. In 55 ulcers of miscellaneous nature (including simple ulcers of the stomach, cicatrices, &c.) there were three hepatic abscesses, and in 167 cases of tubercular ulcers there were 12 in which "small tubercular cavities" existed in the liver, but no abscesses of that organ. PAUL BERGÈS—*Étude sur les abcès du foie consécutifs a la dysentérie des régions tempérées*, Paris Thesis, 1876, No. 139. This essay contains three cases observed by BEHIER—Gaz. des Hôpitaux, Oct., 1869, pp. 457 and 461; one by GUBLER—Bull. de la Soc. Anat. for 1871, p. 571; one by GALLARD—L'Union Méd., T. XIII, 1872, p. 232; and one by LANCEREAUX—Mém. d'Anat. Path., Paris, 1863, p. 55. It contains, besides, two previously unpublished cases, and three of the cases of CHEYNE—*vide supra*—making eleven cases in all. I note that one of BEHIER'S cases, however, had been two years a resident in Africa.

* HEUBNER—*Dysentery*, in Ziemssen's Cyclopædia, Amer. Transl., Vol. I, New York, 1874, p. 546.

† ABERCROMBIE—*Diseases of the Stomach, Intestinal Canal, Liver, &c.*, Edinburgh, 1828, p. 250: "I am also informed by Dr. KNOX of this city, that he had opportunities of examining the bodies in 64 cases of chronic dysentery from India, Ceylon, and the coast of Africa, and that he found the liver diseased in two only of all this number." ABERCROMBIE remarks, of his own experience: "I have never seen the liver affected in the dysentery of this country, except in one or two chronic cases." G. ROULLET—*La dysenterie chronique des pays chauds*, &c., Paris Thesis, No. 28, 1874, p. 27 *et seq.* GEORGE BUDD—*Diseases of the Liver*, 3d Edit., London, 1857, p. 73—observed 15 cases of liver abscess, at the seaman's hospital, "in sailors most of whom had been in the East." Eight of these cases coexisted with ulcers of the large intestine; also two cases of dysentery with liver abscess, at King's college hospital, one of them a man who had contracted his dysentery in India, p. 82. But BUDD does not state how many cases of dysentery without abscess occurred in these hospitals in the same class of patients during his time of observation, so that his figures throw no light on the question in the text. STEPHEN H. WARD—*On some Affections of the Liver and Intestinal Canal*, &c., London, 1872, p. 18. He also states that while physician to the seaman's hospital he saw there 22 cases of liver abscess, p. 2.

‡ F. V. L. BROKAW—*Dysenteric ulceration and sloughing of the mucous membrane of the intestines as a cause of abscess of the liver*, St. Louis Med. and Surg. Jour., Vol. XV, 1857, p. 484: "During the past two years, while a resident physician in the marine hospital in this city, in twenty-seven fatal cases of dysentery, in which I made post mortem examinations, there were abscesses in the liver in twenty-two." He further states that 10 of the 22 cases "had been the subjects of intermittent fever at a longer or shorter time previous to their admission into the hospital with dysentery," and that in 15 of his cases the dysentery was chronic, the abscesses fewer in number, large, and had a wall of lymph around them, while in the acute cases there was sloughing of the intestinal mucous membrane, and the abscesses in the liver were numerous, small, and "uncircumscribed by lymph." I am assured, in a note from my friend Dr. WM. M. MCPHEETERS, one of the most eminent practitioners in St. Louis, that Dr. BROKAW'S narrative is perfectly trustworthy; he adds: "All the patients in the hospital were river men, and the larger proportion of them running on the lower Mississippi, where they were exposed to malarial influences in a concentrated form." THOMAS FOX—*On the relation of hepatic abscess to chronic dysentery and diarrhœa*, St. Louis Med. Archives, Vol. III, 1869, p. 731. According to this writer 122 cases of chronic diarrhœa and 32 of chronic dysentery were treated in the quarantine hospital, St. Louis, during 1868-9: "Among the 122 cases of chronic diarrhœa there occurred 24 deaths, and among the 32 cases of chronic dysentery, 6 deaths. Among the 24 cases of death from chronic diarrhœa there was found ulceration of the ileum in 8 cases, and of the colon in 2 cases. Among the 6 cases of death from chronic dysentery there was found ulceration of the colon and rectum in 3 cases, of the ileum in 2 cases, and of the rectum in 1 case. Among the 24 cases of death from chronic diarrhœa, abscess of the liver was found in 2 cases; among the 6 cases from chronic dysentery, abscess of the liver was found in 3 cases."

§ The following list of references to fatal cases of hepatic abscess consecutive to dysentery or associated with it, in which on autopsy ulceration or other characteristic lesions were found in the large intestine, includes all the cases of the kind I have found by a pretty thorough search of the American medical journals and transactions up to 1876: W. E. HORNER—Amer. Jour. of the Med. Sci., Vol. XIV, 1831, p. 87. WM. PEPPER—same Journal Vol. XXI, 1837, p. 529; J. T. METCALFE—New York Jour. of Med., Vol. IV, 1850, p. 319; J. M. CLEAVELAND—New York Med. Times, Vol. I, 1852, p. 193; J. B. S. JACKSON—Boston Med. and Surg. Jour., Vol. LV, 1857, p. 525; ALONZO CLARK—New York Jour. of Med., Vol. II, 1857, p. 378—two cases; A. W. PERRY—Southern Jour. of Med. Sci., (New Orleans,) Vol. I, 1866-7, p. 665—three cases; R. B. MAURY—Med. Record, Vol. II, 1867-8, p. 241; MOREHOUSE—Proc. of Path. Soc. of Philadelphia, Vol. I, 1869, p. 55; C. C. LEE—same Proc., Vol. II, 1876, p. 98. MARTIN—same Proc., Vol. III, 1871, p. 45; HERBERT—same Volume, p. 15; DE F. WILLARD—same Volume, p. 101; WEBSTER—Boston Med. and Surg. Jour., Vol. LXXXVIII, 1873, p. 650; L. S. MCMURTRY—The American Practitioner, Vol. X, 1874, p. 280. To these I may add three cases reported in the Trans. of the New York Path. Soc., Vol. II, 1877, viz: MCCREADY, p. 238; ALONZO CLARK, p. 239, and FINNELL, p. 242.

Certainly the comparatively small number of such cases reported in our medical journals would seem to indicate not merely that hepatic abscess is not a frequent complication of dysentery in the United States, but that it is not a very prevalent disease in this country under any circumstances. It might be expected to be more common in the southern than in the northern states, and that it is so in the Mississippi Valley would appear from the testimony of Drake,* who, however, expressed his belief that suppuration of the liver occurred in that region even less frequently than suppuration of the spleen. Drake's opinion of the rarity of liver abscess agrees with that of Nott,† who testified that liver disease generally was exceedingly rare in Charleston, Mobile and New Orleans; and the opinions of these intelligent observers are supported by the several Census Reports and by the Army Statistics of Coolidge,‡ which, indeed, do not give separate figures for liver abscess, but report so small a proportion of deaths from hepatitis (under which head the fatal cases of liver abscess are included) as plainly to indicate its infrequency. Perry§ has suggested that hepatic abscess is really much more prevalent in New Orleans and the southern portions of the United States generally, than the mortuary reports would indicate, believing that, "owing to the obscurity of the disease," it is passed by unappreciated and some other affection diagnosticated. That this occasionally occurs cannot be doubted; but dissections are so frequently made in the hospitals of all our large cities that the lesion in question would assuredly be more frequently reported, in the journals or transactions of societies, if it were not quite rare.‖

The nature of the connection between hepatic abscess and dysentery has given rise to much difference of opinion. The old belief that vitiated bile resulting from the hepatic disease irritated the intestinal mucous membrane and gave rise to dysentery has already been referred to. Annesley,¶ while still holding to this explanation for some of the cases in which the two conditions are combined, admitted that in many others the hepatic complication appeared to be developed subsequently to the intestinal disorder, of which it must be regarded as the consequence rather than the cause. Broussais** went so far as to affirm that all cases of hepatitis which do not result from external violence are consecutive to inflammations of the mucous membrane of the alimentary canal, especially of the duodenum.

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* D. DRAKE—*Principal Diseases of the Interior Valley of North America*, Second Series, Philadelphia, 1854, p. 171. He appears to have obtained notes of seven cases only, to which he adds: "Dr. Fearn, of Mobile, has had several cases, the termination of which I did not record."

† J. C. NOTT—*Examination into the health and longevity of the southern seaports of the United States*, &c., Southern Jour. of Med. and Pharm., Vol. II, 1847, p. 135: "In Charleston (and so with Mobile and New Orleans) diseases of the liver are almost unknown." "I can declare with confidence, and my professional brethren here will sustain me, that I see fewer diseases of the liver in Mobile, than of any other important organ in the body. I do not think I exaggerate, when I say, that the cases in my practice, belonging to Mobile, do not exceed one a year."

‡ The number of deaths in the United States in 1870 from hepatitis was 1,534, or 4 to every 100,000 living persons; in 1860, 200, or .6 to every 100,000 living persons: See Vol. II, *Ninth Census Report*, Washington, 1872, p. xviii. In the census of 1850 hepatitis is not even separately reported, but is included under the head of "disease of liver," of which 1,851 deaths are reported, or 8 per 100,000 living persons. In the last report of COOLIDGE—*Statistical Report of the Sickness and Mortality in the Army of the United States*, Washington, 1860, p. 332—the consolidated abstract of the diseases and deaths of the army for 18 years gives only 26 deaths of hepatitis, acute and chronic, out of an average mean strength of a little over 10,000 men.

§ A. W. PERRY—*Abscess of the liver; its connection with dysentery, loc. cit.*, note §, p. 553: "I am satisfied that it is a very common disease in New Orleans, and the southern portions of the country." This opinion is supported by the fact that the author had observed "within a short space of time," at the Charity hospital, New Orleans, five cases of liver abscess, four of which were complicated with dysentery. One of these cases (No. 4) is so doubtful that the author says: "the abscess in this case, if one existed, and I think it did, probably was small and became encysted;" the patient recovered. The three others died, and are referred to in the note cited above. The author also states that of 3,936 deaths entered on the mortuary records of New Orleans between May 20 and October 8, 1866, but two were attributable to abscess of the liver.

‖ As a further illustration of the rarity of liver abscess, especially in the northern portion of the United States, I may mention that the Museum of the Boston Society for Medical Improvement, when catalogued by J. B. S. JACKSON, Boston, 1847, contained 954 pathological specimens, but one of which was an abscess of the liver, and in this the disease, which followed dysentery, had been contracted on the western coast of Africa. The Proc. of the Path. Soc. of Philadelphia from Oct. 14, 1857, to Dec., 1873, (Vols. I to IV inclusive,) only contain reports of five cases of hepatic abscess besides those cited on p. 553. So also the Trans. of the Med. Soc. of the District of Columbia from July, 1865, to Jan. 1, 1878, only contain reports of four cases. The Trans. of the New York Path. Soc., Vol. II, 1877, (from 1844 to 1876,) contain the largest number of cases, viz: 22, besides those cited on p. 553.

¶ ANNESLEY—*Diseases of India*, London, 1828, Vol. II, p. 199. He admitted also that the two diseases may in some cases be "nearly coeval as respects their origin, or at least so very nearly simultaneous in their attack, that the priority of lesion can scarcely be detected."

** See note to p. 552, *supra*. See also the thesis of his son, CASIMIR A. M. BROUSSAIS—*Sur la duodénite chronique*, Paris Thesis, No. 59, 1825—in which this doctrine is developed at length. These views were adopted by ANDRAL—*Clinique Medicale*, 3me Édit., Paris, 1834, T. II, p. 395.

He pointed out that in the normal state physiological irritations of that membrane provoke the hepatic secretion, in accordance with the law of Bichat,* that glands respond to the stimulation of the surfaces on which their excretory ducts open, and regarded the acute and chronic phlegmasiae of the liver as resulting from the pathological exaggeration of this physiological process.

Ribes† first suggested the idea that the inflammation is propagated from the gastro-intestinal mucous membrane to the liver by means of the portal vein and its branches. This view was especially developed by Budd,‡ who taught that in dysentery "the portal blood may be contaminated either by pus, formed by suppurative inflammation of one of the small intestinal veins; or by matter of other kind resulting from softening of the tissues; or by the fetid gaseous and liquid contents of the large intestine in dysentery, which must be absorbed and conveyed immediately to the liver;" and he thought it probable that contamination of the first two kinds gave rise to small scattered abscesses; of the last "to diffuse inflammation, and a larger, perhaps single, collection of pus." It must be admitted, as Frerichs§ has pointed out, that the doctrine of Budd rested chiefly upon speculative grounds; nevertheless in a somewhat modified form it appeared to be countenanced by the generally accepted doctrine of the production of metastatic abscesses by embolism, which the observations of Virchow‖ placed upon a scientific footing, and, hence, what has been known as the embolic or pyæmic theory, as to the origin of the hepatic abscesses which complicate dysentery, has been very generally received with favor.

Morehead,¶ while admitting that abscess of the liver may occasionally arise in this way, adverts to the frequency with which dysenteric ulceration exists without hepatic abscess, and hepatic abscess without intestinal ulceration, or, indeed, any source whence emboli could be derived, as a proof that this explanation cannot be regarded as generally available. Similar objections have been urged by Bristowe and Frerichs.** The suggestion of Morehead that the cachexia induced by residence in the tropics is the predisposing cause of hepatic abscess in those regions, and that the immediate exciting cause is a chill resulting from exposure to external cold, has been adopted by Frerichs as most in harmony with the facts in the case of those abscesses of the liver which accompany tropical dysentery.

The distinction between small multiple, and large, for the most part single, abscesses of the liver has been emphasized by Murchison, who, as has been already mentioned, speaks of the former as pyæmic, the latter as tropical abscesses.†† The pyæmic abscesses, he believes, may result from any of the sources of pyæmic infection; among others, from

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* Xav. Bichat—*Anat. Générale*, Nouvelle Édit., Paris, 1812, T. IV, p. 614.

† F. Ribes—*Mémoires et Obs. d'Anat.*, &c., T. I, Paris, 1841, p. 36. Exposé succinct des recherches faites sur la phlébite. (July, 1825:) "D'après ce qui vient d'être dit, on voit que dans les entérites et les gastro-entérites, si l irritation et l'inflammation de ces parties se communiquent au foie, ce n'est pas seulement au moyen du canal cholédoque: les veines-portes veinale et hépatique paraissent les principaux moyens de transmission," p. 72.

‡ George Budd—*On Diseases of the Liver*, 3d Ed., London, 1857, p. 89.

§ F. T. Frerichs—*Diseases of the Liver*, Transl. of New Syd. Soc., Vol. II. London, 1861, p. 114.

‖ R. Virchow—*Gesammelte Abhandlungen*, 2te Aufl., Hamm, 1862, p. 219 *et seq.* The first of the papers on the subject referred to was published as early as 1846.

¶ Charles Morehead—*Clinical Researches on Diseases in India*, (1856,) 2d Ed., London, 1860, p. 365. Both these facts have long been known. I need only refer to the statistics of Waring—*Abscess in the Liver*, &c., Trebundrum, 1854, p. 134—as an illustration of the frequency with which hepatic abscess, unconnected with intestinal ulceration, occurs even in India. Of 204 autopsies the intestines were found ulcerated in 147, abraded in 3, cicatrices were found in 3, and no trace of ulceration in 51, or one-fourth of the cases. Compare the statistics of Bristowe, *op. cit., supra*; also the figures reported by Morehead himself in a *Note on the pathology of hepatic abscess*, British Med. Jour., March 20, 1869, p. 258, where, consolidating the cases collected by Leith and Stovell, as well as his own, he obtains 238 cases of dysenteric ulceration without hepatic abscess and 62 of hepatic abscess without intestinal ulceration: "Sufficient, I apprehend, to disprove the pyæmic theory," he remarks; but certainly it did not need these figures to show that the two conditions named may occur separately. This mode of presenting the subject, however, does not even attempt to deal with the fact of their frequent coexistence. I may add that Morehead's opinions have been reviewed by Assistant Surgeon J. F. Foster—*Remarks on the pathology of hepatic abscess*, The Indian Medical Gazette, Vol. II, 1867, p. 219—who ingeniously makes use of Morehead's own cases to attack his conclusions.

** Bristowe—*op. cit.*, p. 552, *supra*. Frerichs—*loc. cit.*

†† Charles Murchison—*Diseases of the Liver*, &c., Amer. reprint, New York, 1868, p. 147 *et seq.* Compare p. 395, *supra*.

ulceration of the stomach or intestine; for the tropical, he inclines to the theory of causation proposed by Morehead.* The relation between pyæmic abscesses of the liver occurring in the latter stages of dysentery and the intestinal ulceration is that of effect and cause; the relation between tropical abscesses and dysentery, when the two coexist, is purely accidental and due to the simultaneous action of the causes of the two affections. Murchison† affirms that large single abscesses of the liver are almost unknown in England and in temperate climates generally, except in persons who have sustained some local injury of the liver, or at some time resided in the tropics.

This statement appears to be too emphatic; such abscesses, though infrequent, do occur both in Europe and the United States, and the designation "tropical abscess" appears therefore less appropriate than the old term "idiopathic abscess." Nor is it always possible, even with the amplest opportunities for dissection, to assign individual cases to the one or the other of these two classes. Certainly in many instances the multiple foci found in the livers of subjects dead of dysentery, resemble in all their characters the pyæmic foci in the liver which occur after gunshot wounds. That similar foci may be found in the lungs, the spleen and the kidneys of subjects dead of dysentery, is shown by the autopsies analyzed in this section. In the cases of multiple foci in the liver to which I refer, the foci usually correspond in their distribution to the branches of the portal vein, and in their form and dimensions to a territory supplied by one of these branches. In some of these cases, on microscopic examination, the foci prove to consist merely of liver tissue and extravasated blood in a state of necrotic metamorphosis; in others suppuration has already commenced at the periphery of the foci. In the few cases that I have myself been able to examine I have not been so fortunate as to find recognizable emboli plugging the branches of the portal vein or hepatic artery leading into the necrotic masses; and I incline, therefore, to the belief that in some cases putrid semifluid debris from the thrombi connected with the dysenteric ulcers‡ may lodge in the capillaries of the liver and serve as the starting point of these local necrotic processes, which, I admit, may also result from solid emboli.

It is readily conceivable that in the more advanced stages of the process just sketched the accumulating pus might quite conceal the original infarction, the debris of which would

* MOREHEAD—*op. cit.*, p. 361. According to this writer the months of February and March are those in which the greatest number of cases of hepatitis occur. The following table, combined from the tables on pp. 274 and 362, contrasts the relative proportion of admissions from hepatitis and dysentery in two of the Bombay hospitals, the figures representing the per cent. of total admissions:

| Season. | Dysentery. | | Hepatitis. | |
|---|---|---|---|---|
| | European General Hospital. | Jamsetjee Jejeebhoy Hospital. | European General Hospital. | Jamsetjee Jejeebhoy Hospital. |
| Cold months—November, December, January | 10.8 | 10.2 | 3.8 | 1.7 |
| Wet months—June, July, August | 7.0 | 10.7 | 2.9 | 1.4 |
| Transition from cold months—February, March | 6.3 | 6.4 | 4.8 | 2.0 |
| Transition from rains—September, October | 5.4 | 8.9 | 3.2 | 1.0 |
| Hot months—April and May | 5.1 | 7.2 | 3.4 | 1.6 |

These figures, so far as they go, would seem to show that the annual fluctuations of hepatitis in India neither coincide with those of dysentery nor immediately follow them. The author remarks: "It is very probable that future research will show that the exhausted and enfeebled by continued heat, and its associated debilitating conditions, are very prone to hepatitis, and that in such individuals the inflammation is very frequently excited by exposure to external cold—I mean to such depression of temperature as suffices to influence bodies whose power of generating heat is low." But he also thinks that tropical heat of itself "is occasionally an exciting cause of hepatitis," and thinks this explains the occurrence, during the hot months, of hepatitis in "plethoric Europeans, lately arrived in India, with excreting functions deranged by free living," p. 363.

† *Op. cit.*, p. 165.

‡ This view I have elsewhere discussed in connection with the general subject of pyæmia: J. J. WOODWARD—*Causes and pathology of pyæmia, (septæmia,)* Trans. of the American Medical Association, Vol. XVII, Philadelphia, 1866, p. 173. According to the recent bacteria theories it should be the micrococci in these semifluid debris which do the mischief.

be distributed through the contents of the resulting abscesses. It would then be difficult to be sure, especially when the purulent collections are not numerous, that they arose in this way rather than as a result of acute parenchymatous hepatitis, which is probably, as was formerly believed and as Rindfleisch* still maintains, the precursor of idiopathic hepatic abscess. In a word, while I feel constrained to admit the distinction between pyæmic and idiopathic abscess of the liver, there are certain cases which I find difficult to assign to one category rather than to the other. Nor am I able to admit that no connection exists between large hepatic abscesses and the dysenteric process. The proportion of these cases which coexist with dysentery appears too large to be accidental. I incline, however, to believe that the relationship in these cases between the liver abscess and the dysenteric process is similar to that which exists between pneumonia and dysentery, namely, that the conditions which might produce pneumonia or hepatitis in healthy subjects are still more prone to do so in those who are debilitated by a pre-existing flux.

It has already been shown in the case of pneumonia complicating dysentery that, like uncomplicated pneumonia, it generally proved fatal in the colder months, and as pneumonia is a disease of brief duration, and as the number of cases included in the statistics is large, this fact must be of great significance in connection with the question of causation. Idiopathic hepatic abscess is, however, so often a protracted disease that the date of the fatal issue is less significant. I note that the ten cases of large hepatic abscess summarized on page 548 as having occurred in connection with dysentery during the war all proved fatal between the first of August and the last of January, which is quite consistent with the theory that they all originated from chill after previous exposure to the heat of summer. Unfortunately, however, for any such explanation, the fifteen cases of multiple liver abscess which occurred in connection with dysentery during the war, with a single exception, proved fatal between the first of August and the last of December, so that if it may be drawn from the first group of facts, the opinion would be fairly applicable to the second.†

Besides the *adhesions* which connected the liver to adjacent parts in several of the cases of hepatic abscess just mentioned, it was adherent to the diaphragm in cases 90, 167 and 778, and to the diaphragm and abdominal parietes in case 794. In cases 140, 533, 819 and 868 circumscribed thickenings of the capsule, generally supposed to have been *cicatrices*,‡ were observed on the convex surface of the liver. In case 96 a "cyst," the size and character of which are not recorded, was found in the lower portion of the right lobe of the liver. In case 550 the liver contained *tubercles*, (lung phthisis and tubercles of the spleen coexisted.) In case 833 masses of some undetermined *neoplasm* of "cartilaginous hardness" were found in the liver, and a similar mass existed on the surface of the left lung. In case 859 the left lobe of the liver was larger than the right.

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* E. RINDFLEISCH—*Lehrb. der Path. Gewebelehre*, 3te Aufl., Leipsic, 1873, p. 419.

† Of 10 cases of large abscess of the liver complicating dysentery, (see p. 548, *supra*,) 1 died in August, 1 in September, 1 in October, 3 in November, 1 in December, and 3 in January. Of 15 cases of multiple abscess of the liver (*loc. cit.*) complicating dysentery, 1 died in February, 3 in August, 5 in September, 1 in October, 2 in November, and 3 in December. It will further be noticed that of the three additional cases mentioned in note ‡, p. 548, those of large abscess died, one in October, the other in November, and the case of multiple abscess in October. I may add that of the nine cases of abscess of the liver unconnected with dysentery, of which specimens are preserved in the Museum, (*loc. cit.*,) one is a case of multiple abscess, which proved fatal in April; the others were large, for the most part single abscesses, of which 1 died in September, 1 in November, 2 in December, 3 in January and 1 in February. Of the 8 rejected specimens (*loc. cit.*) the date of death was not given in 2 cases; in 1 the abscess was multiple—the patient died in January; in the others the abscesses were large, generally single—2 patients died in July, 1 in November, 1 in January and 1 in February. More extensive statistics of the date at which hepatic abscess proves fatal would be useful; still more so would be statistics as to the date at which it originates.

‡ That these were really cicatrices is highly improbable. P. CH. A. LOUIS—*Mémoires ou Recherches Anatomico-Pathologiques*, Paris, 1826, p. 468—would not even admit the cicatricial nature of the fibroid, cicatrix-like structures sometimes seen in the interior of the liver, remarking that, before admitting this interpretation, it would be necessary to have seen them in all their stages "from the moment when they commence to form, still containing between their extremities a certain amount of pus, until they are complete and more or less dense, which has not been done."

The quantity and characters of the *bile* found in the gall-bladder are not mentioned in the majority of these cases. In eight of the cases of follicular ulceration and thirty-eight of the undetermined cases the gall-bladder is said to have been distended with bile, or full of bile, or quantities above half an ounce are recorded as having been observed, although nothing is said of the quality or appearance of the fluid. The latter point is briefly referred to in the following cases of follicular ulceration: In case 543 the gall-bladder was moderately full of healthy-looking bile; in case 195 it was filled with yellow, and in case 198 with amber-colored bile; in case 370 it contained an ounce and a half of clear straw-yellow bile with a yellowish flocculent sediment; in case 351 nineteen drachms of yellowish, very viscid bile; in case 339 a small quantity of light-yellow viscid bile; in case 374 six drachms of orange-yellow bile; in case 293 it was distended with greenish bile; in case 314 full of very green bile; in case 389 it contained two ounces and a half of dark-green bile with considerable intensely green sediment; in case 371 it contained five drachms, and in case 387 three, of dark-green viscid bile; in case 379 it contained one ounce and a half of dark-brown very viscid bile; in case 336 it was filled with dark viscid bile; in case 333 it contained some dark viscid bile; in case 381 six drachms of dark reddish-brown bile; in case 454 an ounce of dark-colored bile; in case 819 it was full of dark-colored bile; in case 350 it contained two drachms of reddish viscid bile; in cases 426 and 428 it was filled with viscid bile. In case 350 the gall-bladder also contained a calculus a quarter of an inch in diameter.

The appearance of the bile is also mentioned in the following undetermined cases: In case 240 the gall-bladder was distended with thin light-colored bile; in case 618 with a colorless albuminous liquid; in case 721 with a light-yellow liquid which had "little appearance of bile;" in case 319 it contained about an ounce of thin orange-yellow bile; in case 356 six drachms of light-yellow watery bile; in cases 193 and 396 a small quantity of light-colored bile; in case 448 an ounce and a half of yellow bile; in case 520 half an ounce of yellow inspissated bile; in case 87 it was distended with dark gelatinous bile; in case 565 it contained six ounces of dark, grumous, viscid bile; in case 621 it was distended with viscid bile; in case 408 it contained seventeen drachms of viscid bile; in case 636 it contained two ounces of black tar-like bile; in case 384 ten drachms of molasses-colored viscid bile; in case 365 seven drachms, and in case 383 ten, of dark-green bile; in cases 777 and 778 each, an ounce of "unhealthy" bile. In case 638 the gall-bladder contained a small calculus; in case 609 five black calculi; in case 743 six small dark-colored calculi; and in case 80 nine calculi. In one of the cases of follicular ulceration and six of the undetermined cases the gall-bladder is said to have been empty.

If the foregoing observations are compared with the condition of the gall-bladder and its contents as recorded in the non-ulcerative and diphtheritic cases,* it will be seen that the quantity and character of the bile found after death from diarrhœa and dysentery are quite as variable as in the case of those dead from other diseases. This agrees with the experience of most other observers.† I am not acquainted with any satisfactory attempts to find morbid peculiarities in the bile of such cases by chemical analysis.

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* See pp. 316 and 459, *supra*.

† Some few writers state that the bile found after death from dysentery is generally dark-colored and viscid. Thus, according to HAUFF—S. 328, *op. cit.*, *supra*, p. 534—this was the experience of the Wurtemberg physicians, who, however, in some rare instances found a light-colored slimy fluid or a transparent serum. PARKES—p. 46, *op. cit.*, *supra*, p. 551—declares that the condition of the bile is so far abnormal that the liver must be "more or less diseased in every case of dysentery." Usually he found two conditions present: 1, If the gall-bladder was "moderately full or half-empty, the bile is thin, transparent, of a brownish red colour; not stringy, sometimes with particles suspended in it apparently crystalline, and sometimes like particles

The *spleen* is said to have been softened or friable in rather more than a dozen of the cases of follicular ulceration and about twice as many of the undetermined cases. In a somewhat larger number of cases it is spoken of as firm, hard, indurated or tough. In nine of the cases of follicular ulceration and eighteen of the undetermined cases it is said to have been *small*, but its weight is not specified. In fifteen cases of the first class the small size of the organ is shown by its weight, viz: it weighed six ounces in case 746; five ounces in case 368; four and a half in cases 371 and 379; four and a quarter in case 333; four in cases 196, 201 and 381; three and three-quarters in case 336; three and a half in cases 198, 355, 370 and 398; three and a quarter in case 350; and two in case 458. The same occurred in thirty of the undetermined cases, the organ weighing six ounces in cases 727, 759 and 806; five and a half in cases 375, 753 and 772; five in cases 418, 578, 731, 735, 739 and 768; four and a half in cases 384, 406 and 767; four and a quarter in case 356; four in cases 411, 580, 721, 765 and 773; three and a half in case 745; three and a quarter in case 396; three in cases 260, 407, 459 and 755; two and a half in cases 417 and 747; and two in case 296.

On the other hand, in seven of the cases of follicular ulceration and twenty-seven of the undetermined cases the spleen is said to have been *large*, or enlarged, without indicating its weight. In six cases of the first class the abnormal size of the organ is shown by its weight, which was nine ounces and a half in case 195; eleven and a quarter in case 339; twelve and a half in case 389; twelve and three-quarters in case 363; thirteen and a half in case 374; and twenty-five in case 401. Among the undetermined cases the spleen is said to have been twice the normal size in cases 84 and 453; four times the normal size in case 658; and five times in case 636. The abnormal size of the organ is shown by its weight in twenty-six cases, viz: it weighed nine ounces in cases 743, 756, 808 and 812; ten in cases 719 and 813; ten and a half in cases 380, 762, 775 and 807; twelve in cases 726 and 744; thirteen in cases 228 and 736; thirteen and a half in case 365; fourteen in cases 289, 410 and 757; sixteen in cases 728, 737 and 741; seventeen in case 383; thirty-two in case 851; thirty-nine and a half in case 420; forty-three in case 614; and fifty-six in case 791.

In eight of the cases of follicular ulceration and fifteen of the undetermined cases the spleen is said to have been *congested*, and in a few instances its trabeculæ or Malphigian

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of Cayenne pepper;" 2, "In other cases the gall-bladder is full, perhaps distended with a thick dark green, very stringy viscid bile." SAVIGNAC—p. 278, *op. cit., supra*, p. 531—found the gall-bladder distended with tarry (poisseuse) bile, of a blackish or very dark-green color in acute cases; in chronic cases it was lighter colored and more fluid. BARRALLIER—Art. *Dysenterie*, in Nouv. Dict. de Méd. et de Chir. Pratiques, T. XI. Paris, 1869. p. 761—says the gall-bladder in dysentery is distended by a thick bile which has the consistence of tar, and its color, if examined *en masse*, but is yellow if spread in thin layers. I must confess I agree with HEUBNER—S. 528, *op. cit., supra*, p. 529—that the bile in dysenteric subjects presents no characteristic alterations. In the present state of our knowledge of the chemistry of the bile it is not surprising that nothing definite has been determined by analysis. OESTERLEN—*Zur Chemie der Ruhr*, Zeitschr. für Rat. Med., Bd. VII, 1849, S. 253—in 46 autopsies, found the gall-bladder and its contents "in the same variable conditions as in other dead bodies," S. 276. He made a chemical analysis in but one case, with the following results: water 844.2; bile acids, fat and mucus 142.4; inorganic salts 13.4, in 1000 parts, whence he concludes merely that the bile was concentrated as is usual after long retention in the gall-bladder. Surgeon THOMAS ANTISELL, U. S. Vols.—*On the constitution and source of the bile*, The Amer. Jour. of the Med. Sciences, Vol. XLVII, 1864, p. 91—while in charge of Harewood hospital during the civil war, analyzed the bile found in twenty subjects dead of chronic dysentery, (chronic diarrhœa.) The method used was an application of the principle of dialysis. The gall-bladder containing the bile was suspended for 30 to 48 hours in a vessel containing alcohol or some other selected fluid, then transferred to another vessel for about 30 hours, and subsequently to a third and fourth in the same way; the liquids used besides alcohol were ether, chloroform and coal oil; creasote was added to prevent decomposition. No weighings of any kind appear to have been attempted except in one case, in which the total solids were 10.4 per cent. of the fluid. The chief object appears to have been to arrive at a list of the ingredients, which are given as follows: "1, Epithelium. 2, Mucous corpuscles. 3, Pigment cells, yellow or greenish. 4, Brown coloring matter, resinoid and amorpheus. 5, Cholesterin. 6, Fatty globules. 7, Common salt. 8, Carbonate and phosphate soda (neutral) and potassa. 9, Glycocholate soda. 10, Margaratn soda. 11, Hæmatoidin. 12, Hippuric acid. 13, Albumen." He "never observed any form like the crystals of taurine or of taurocholic acid, nor any substance having the reactions proper to that acid," and concludes that "it is not present in human bile." Of hippuric acid and hæmatoidin he says: "I have met with one example of each in the twenty specimens examined." The number of cases in which albumen was found is not specified, but as the author concludes that "the bile is an albumino-serous liquid," &c., it may be presumed to have been pretty constant. These analyses, however, cannot be regarded as showing any peculiarities in the bile of chronic dysentery, control-researches conducted in the same way on the bile of subjects dead of other diseases being wanting.

bodies are said to have been unusually distinct. In case 201, in which *metastatic foci* existed in the liver, the spleen is said to have contained "a single deposit of tubercle of some size," which, however, I presume was of the same character as the foci in the liver, and the same remark applies to the "tubercles" said to have been observed in the kidneys in this case. Of the same nature probably were the numerous "small hard nodules" found in the spleen in case 872, in which an abscess of the liver also existed; the "light-yellow masses" found in the lungs and liver, as well as the spleen, in case 727; and the abscesses in the spleen in case 304. In cases 500* and 550 the spleen contained tubercles; in case 745 a few small calcareous deposits. In cases 140, 167 and 601 the spleen was adherent to the abdominal parietes; in case 264 to the liver; in case 593 to the kidney; and in cases 227 and 858 to the diaphragm. In cases 820 and 858 a localized thickening of the splenic capsule existed, forming a white thickened patch on the surface of the organ. In case 371 the upper extremity of the spleen was lobulated, and in case 697 there was a supernumerary spleen as large as a filbert.

A comparison of the foregoing observations with those relating to the spleen in the non-ulcerative and diphtheritic cases† shows that there was no such constant diminution in the size of the organ as some have asserted to exist in dysentery.‡ It is very probable that this condition is of frequent occurrence in uncomplicated cases, but when dysentery attacks those whose spleens are already enlarged in consequence of the malarial influence, or when it is complicated by the typhoid process, the most various degrees of enlargement of the organ may be found after death. Nor should the possibility of embolic processes and consequent inflammatory conditions be overlooked, although these may be expected to occur less frequently than similar conditions in the liver.

The *pancreas* is only mentioned in a few instances, and in these no marked abnormity appears to have been observed.§

The *kidneys* are not mentioned in the majority of the cases, the omission being even more frequent among the undetermined cases than the others. In a large proportion of those cases in which their condition is recorded they were *large and pale*, the result of parenchymatous swelling bordering on fatty degeneration; sometimes they were actually fatty. More or less imperfect descriptions point to this condition in seventeen of the cases of follicular ulceration and twenty-nine of the undetermined cases. Thus, among those of the first class, the kidneys or their cortical substance are said to have been pale, without, however, specifying any abnormal increase in their size, in cases 368, 370, 387 and 426; in case 336 the right kidney was pale, the left congested; in case 310 the right kidney

* The spleen from this case is preserved in the Museum, Med. Sect., No. 298. † *Supra*, pp. 316 and 460.

‡ Although spleens of small size had previously been several times observed in individual cases of dysentery, the opinion that the organ is usually diminished in size seems to have been first suggested by the Wurtemberg physicians during the epidemic of 1834—HAUFF, S. 328, *op. cit.*, p. 534, *supra*—even they, however, in occasional cases, sometimes saw the spleen enlarged. This opinion has been repeated in various quarters, its latest expression being given by HEUBNER—S. 528, *op. cit.*, p. 529, *supra*—"Die Milz ist regelmässig klein." That, on the contrary, the organ is enlarged, especially in cases of malarial complications, has been pointed out by a number of writers, among whom I may specify VOGT—*Monographie der Ruhr*, Giessen, 1855, S. 65; JULIEN—p. 70, *op. cit.*, *supra*, p. 550; and BARRALLIER—p. 761, *op. cit.*, *supra*, p. 550. SAVIGNAC—p. 270, *op. cit.*, *supra*, p. 552—declares "the spleen is healthy except in case of paludal intoxication." On the other hand, according to ROKITANSKY—*Der dys. Prozess*, Oesterreich. Jahrb., Bd. 29, 1839, S. 93—swelling of the spleen, such as occurs in all dyscrasic processes, especially in typhus, is common enough in dysentery, but also very frequently absent. GRIESINGER—S. 541, *op. cit.*, *supra*, p. 551—declares in like manner that he saw in Egypt a series of cases in which there was more or less acute swelling of the spleen, sometimes even wedge-shaped inflammatory foci, (keilförmige Entzündungsherde.) LYONS—p. 96, *op. cit.*, *supra*, p. 552—in the Crimea, appears to have observed similar conditions, chiefly in cases in which dysentery was complicated with typhoid fever: "Extensive deposit, with excessive enlargement of this organ, was a very common occurrence, resulting from the combined influence of coexistent morbid states, such, for instance, as the development of dysentery after typhoid fevers or vice versa." He adds that in such instances the size of the organ was very much increased, and the weight reached 10, 14 or even 20 ounces.

§ In case 198 the pancreas is said to have weighed seven ounces, which is probably a mistake, seven drachms having been intended. The case is cited from the "Observation" book of Assistant Surgeon MCGILL, p. 100, [see note to p. 125, *supra*,] where it is stated of the same pancreas that it was "small and flaccid."

was large and pale, the left healthy; in case 225 both kidneys were enlarged and pale; in case 295, enlarged and friable; in several cases the substance of the kidneys is said to have been pale, and the weights of the organs recorded range from six ounces upwards, viz: in case 195 they weighed six ounces each; in case 355 the right eight and a half, the left seven; in case 339 the right weighed nine ounces, the left nine and a half. In two other cases, viz: 333 and 401, the kidneys weighed above six ounces each, but their appearance is not recorded. In cases 320, 389, 732 and 870 the kidneys are said to have been fatty.

Among the undetermined cases, the kidneys or their cortical substance are said to have been pale in cases 80, 193, 365, 388, 457 and 578; the same appearance was combined with increased weight in case 738, in which the kidneys weighed six ounces and a half each; case 383, the right six, the left seven; and case 807, in which the kidneys weighed together eighteen ounces. In ten cases, viz: 396, 720, 727, 731, 733, 737, 744, 753, 806 and 812, the kidneys weighed from six ounces to nine and a half each, but their appearance is not recorded. In cases 272, 298, 308, 319, 441, 459, 519, 526, 541 and 757 the kidneys are spoken of as fatty. To the foregoing it may be added that in one of the cases of follicular ulceration, 697, and four of the undetermined cases, 688, 700, 704 and 705, the kidneys are said to have been "granular," and that in one of these, case 704, the urine is said to have been albuminous.

The microscopic appearances of the kidneys in many of the cases just enumerated is well described by Assistant Surgeon Harrison Allen, U. S. A., in his record of case 378:* "The kidneys were large; the right measured five inches by two and a half, and weighed seven ounces and a half; the left measured five inches by three, and weighed eight ounces; the cortical substance of both was pale but injected, the section appearing as if sprinkled with red pepper; the bases of the pyramids were of a very dark-purple color, the capsules readily elevated, the pelves highly injected."

A comparison of the preceding paragraphs with the remarks on the condition of the kidneys in the non-ulcerative and diphtheritic cases† would seem to indicate that the kidney complications under consideration were much more frequent in the chronic ulcerative cases than in the acute cases, or even in those chronic cases which were unattended with intestinal ulceration. It is to be regretted, however, that in so large a number of cases of each group the condition of the kidneys was either not examined or not recorded, and that in so many other cases the record is unsatisfactory, for this makes it impossible to express numerically the frequency of the accidents in question. I do not doubt, however, that, especially in those chronic cases in which the intestines are ulcerated, the lesions observed by Alonzo Clark and myself‡ would have been more frequently found had the kidneys been more critically investigated.

* See p. 522, *supra*. † *Supra*, pp. 317 and 460.

‡ ALONZO CLARK, see note to p. 500, *supra;* see also HENRY W. COOKE—*The diarrhœa of soldiers*, The Amer. Med. Times, VI, 1863, p. 102—who examined the same cases as Prof. CLARK at Bellevue hospital: "The kidneys in this disease have, without a single exception, been found diseased; a few very markedly so. Their color somewhat lighter than natural, the weight as a rule increased, the extremes being 3½ in the smallest and 6½ ounces in the largest, the vascularity not greatly changed. The longitudinal section revealing more or less disproportion between the secreting and tubular structures, the cut surface usually lighter in color than natural, and having a granular appearance. The microscope revealed uniformly a granular condition of the epithelium lining the tubuli uriniferi; which was readily detached, and occluding the tubules to a greater or less extent. In only one instance was there any excess of fibrous material demonstrable, the kidney weighing only three and a half ounces; in this, however, the excess was very slight. This condition of the kidney, as a rule, is indicated by the presence of casts in the urine previous to death. Albumen is not present." I myself had frequent opportunities to observe this condition of the kidneys in the course of autopsies in the Washington hospitals, or in specimens brought while fresh to the Army Medical Museum. In 1863 I wrote—WOODWARD, *Outlines of the Chief Camp Diseases*, &c., Philadelphia, 1863, p. 251: "The kidneys are very often more or less enlarged, flabby, the cortical portion encroaching on the pyramids, the epithelium of the tubuli uriniferi granular or even fatty." Compare the observations of TREITZ and ZIMMERMANN as to the condition of the kidneys in acute dysentery—see notes to p. 389, *supra*. I may add that the condition of the kidneys in dysentery has not generally received the attention it deserves. Many authors appear to think with PARKES—p. 48, *op. cit.*, *supra*, p. 551—that "what changes are seen are probably antecedent to the intestinal disease." FINGER—S. 134, *op. cit.*, *supra*, p. 552—saw the

Not including any of the foregoing cases, the kidneys are said to have been *congested* in six of the follicular and seven of the undetermined cases. In some of these they were doubtless in an early stage of the condition just described; in others the congestion was merely hypostatic. *Metastatic foci* probably existed in the kidneys more frequently than was observed. Among the cases of follicular ulceration, the deposits described as "tubercles" in the kidneys of case 201, and the depressed softened spot in the right kidney of case 368, "in which the parenchyma was undergoing some degenerative change," were, I suppose, probably of this nature. Among the undetermined cases, in case 290 there was an abscess near the middle of the right kidney; in case 356 both kidneys contained a number of "small, white, purulent deposits," and there was a larger abscess in the left kidney; in case 447 small abscesses were observed in both kidneys. I suppose the deposits interpreted as tubercles in the kidneys in case 469 to have been probably of the same nature. In case 703 *tubercles* are said to have been observed in the left kidney, and in case 722 in both kidneys; (in these cases tubercles existed in the lungs.) In case 370 there were two small cysts in the right kidney; in case 261 the kidneys were greatly enlarged and contained innumerable cysts. [These kidneys are preserved in the Museum, Nos. 27 to 29, Med. Sect.] In case 588 the kidneys were fused together at their inferior extremities—horse-shoe kidney. [The specimen is preserved in the Museum, No. 23, Med. Sect.]

The condition of the *urinary bladder* is very seldom mentioned. In case 447 its mucous membrane seemed thickened, which is the only abnormity recorded. In about two dozen cases the bladder is said to have been full of urine, but this was not generally tested for albumen. Only in cases 194 and 704 was albumen found in the urine. In the first of these cases the kidneys are said to have been "congested," in the second "granular." It is greatly to be regretted that the condition of the vesical mucous membrane was not more critically examined in these autopsies.* It is probable that the catarrhal inflammation of this mucous membrane, which often occurs in dysentery, is generally so slight that no recognizable lesions are found after death, but doubtless in many cases inflammatory changes would be found if they were sought by an instructed observer.†

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lesions of Bright's disease in 8 of 231 subjects dead of dysentery; he appears to have regarded it as a mere coincidence of the two diseases. He also noticed in several instances a form of partial nephritis, manifested by the appearance in the cortical substance of the kidneys of little gray, yellowish, or purulent infiltrations about the size of millet seeds, S. 145. VOGT—S. 65, *op. cit., supra*, p. 560—states that he found that albuminous urine without dropsy not unfrequently occurred during the course of dysentery, and that in such cases mere hyperæmia of the organs was observed after death, without further degenerative changes; genuine Bright's disease occurs either as a sequel to dysentery, or as the primary disorder during the progress of which the dysentery is developed. LYONS—p. 53, *op. cit., supra*, p. 552—found tubercle "pretty often" in the kidneys; in one instance the organs appeared to be the seat of "granular, fatty degeneration;" in another, of suppurative pelvinephritis, p. 50. CORNUEL—*Mém. sur la dysent. observée a la Basse-Terre, (Guadeloupe,)* Mém. de l'Acad. Royale de Méd., T. VIII, 1840, p. 117—reports, in the varieties of dysentery which he calls "gangréneuse" and "muco-sanguinolente," that the kidneys were "red, dry, and contained in their pelves a very small quantity of a whitish, fatty liquid resembling pus much more than urine." This description is repeated by SAVIGNAC—p. 279, *op. cit., supra*, p. 552—as his account of the condition of the kidneys in dysentery, to which he adds that similar observations have been made by SIMONNOT. According to BARRALLIER—p. 765, *op. cit., supra*, p. 559—the kidneys may be congested, and of a marked red color, but most frequently present nothing abnormal. HEUBNER—S. 528, *op. cit., supra*, p. 559—more correctly says that venous hyperæmia of the kidneys is found, and that in chronic dysentery they are often the seat of parenchymatous inflammation; also that a suppurative catarrh is very commonly found in the pelves of the kidneys.

* See p. 461, *supra*.

† FINGER—S. 145, *op. cit., supra*, p. 552—in one case found the urinary bladder contracted, its mucous membrane in places of a dirty slate-gray, its muscular coat somewhat hypertrophied. JULIEN—p. 72, *op. cit., supra*, p. 550—examined the bladder in 54 instances: In 2 it was distended with urine; in 22 it contained a good deal of urine, but was not distended; in 12 there was but little urine in it; and in 6 it was completely empty. He observed, however, no noteworthy lesions of the mucous surface; in one instance it presented little injected elevations, (mamelons,) apparently due to irregular infiltrations of the submucosa; in another it presented little hard superficial cords, (de petits cordons,) and the superficial veins were varicose; in the other cases nothing anomalous was found. HEUBNER—S. 528, *op. cit., supra*, p. 529—does not even mention the condition of the bladder in his account of the lesions of dysentery. The plan of this work does not embrace a discussion of the lesions of the female genital organs occasionally observed in dysentery. A few words with regard to them may, however, be added to this note. MURSINNA—*Beob. über die Ruhr*, Berlin, 1787, S. 65—has related a case observed by him during the Herford epidemic, in which a severe dysentery occurring in a pregnant woman, miscarriage at the 7th month followed; subsequently a discharge from the vagina occurred, consisting of blood and mucus and resembling the dysenteric stools in odor and appearance; thereupon the discharge from the bowels ceased and the patient recovered. This was a fortunate termination of a class of cases described by ROKITANSKY—*Oest. Med. Jahrb.*, Bd. XX, 1839, S. 91, *op. cit.*, note †, p. 438, *supra*—who has strongly insisted upon the anatomical analogy between the dysenteric process in the intestine and the puerperal process in the uterus, and has pointed out that the two sometimes coexist in the same individual. VOGT—*Monographie der Ruhr*, Giessen, 1856, S. 65—declares that this observation has been confirmed in his own practice.

PATHOLOGICAL HISTOLOGY OF CHRONIC DYSENTERY.—The processes to be studied in this connection are chronic ulceration consecutive to acute diphtheritic dysentery; chronic non-ulcerative inflammation, including that variety which is accompanied by cyst-formation; follicular ulceration; and ulceration unconnected with the solitary follicles. With regard to the first of these processes nothing need be added to what has already been said when the histology of diphtheritic dysentery was under discussion;* each of the others will require some consideration in this place.

1. *Chronic non-ulcerative inflammation and cyst-formation.*—As to the usual forms of chronic inflammation little need be added to what has been said under the head of "histological changes in the inflamed intestine."† The lesions found in the subacute and chronic cases are very similar to each other. In a general way the pigment deposits become more abundant and the submucosa grows thicker the longer the case lasts, but these characteristics vary also with the intensity of the process as well as with its duration, so that it would be impossible to determine from the anatomical appearances what might have been the duration of the disease. It is also worthy of note that even in the most protracted cases the tissue infiltrated by the lymphoid swarm retains very nearly all the characteristics which it presented during the subacute stages. There seems to be little or no tendency toward the development of a fibrillated matrix between the new elements, a fact which explains why it is that the possibility of resolution and ultimate recovery always remains, even in those cases of chronic dysentery in which there has been ulceration or sloughing, except when too large an area of the mucous membrane has been destroyed. This fact is in marked contrast to what happens when the ulcers heal; in that case an abundant fibrillated matrix is speedily developed between the lymphoid elements of the granulation tissue and a characteristic cicatrix is the result.

It may also be repeated here that amyloid degeneration of the intestine is especially to be looked for in the chronic cases, but nothing need be added to the description of that condition already given.‡ So, too, the peculiar outgrowth of the glands of Lieberkühn into the solitary follicles of the colon, figured by Kelsch,§ has already been described in connection with the histology of the diphtheritic intestine, and it was then stated that in chronic catarrhal inflammation of the large intestine some degree of this process is very frequently present. It will be seen further on that conditions which indicate the previous occurrence of this lesion are frequently encountered in all those follicular ulcers in which the enlarged follicle has not been destroyed by ulceration before the examination is made. Nothing

* *Supra*, p. 461 *et seq.* † *Supra*, p. 325. ‡ *Supra*, p. 333 *et seq.*

§ KELSCH—*Critique et recherches histologiques sur l'anat. path. de la dysenterie*, (read March 15, 1873,) Mémoires de la Soc. de Biologie, 1873, p. 3, with a colored lithograph; also by the same—*Contributions à l'anat. path. de la dysenterie chronique*, Archives de Physiologie, T. V, 1873, pp. 406 and 573—three lithographic plates. According to him, the characteristic lesions in chronic dysenteric diarrhœa, that is, the chronic ulcerative catarrh described further on, are as follows: 1. The development between the glands of Lieberkühn of an embryonic tissue resembling granulations, which gradually takes the place of these glands. 2. The glands of Lieberkühn meanwhile become deformed, are pushed apart, often undergo cyst-like dilatation. 3. The development of a swarm of new elements in the submucosa, especially in that vascular part of it which is nearest the mucous layer and around the closed follicles. 4. The invasion of the tissue of the closed follicles by glandular culs-de-sac, the glands of Lieberkühn transformed by disease, which ultimately replace the proper tissue of the follicles. The plates which accompany the original memoir and the first paper in the Archives cited above illustrate these lesions. The plate accompanying the second paper in the Archives represents chronic dysentery. It shows the same processes, with the addition of losses of substance in the mucosa, and marked alterations in the lymphatics and bloodvessels. The lymphatics are enormously dilated, and contain a fibrinous reticulum, in which lymph cells and large swollen endothelial cells are entangled. Sometimes they are stuffed full of large nucleated cells 12 to 15 thousandths of a millimetre in diameter, (altered endothelium?) The bloodvessels show a tendency to return to the embryonic condition. Their walls are full of new elements resembling those in the submucosa. Their endothelial cells are swollen, and often detached in masses from the elastic tissue beneath. KELSCH suggested that perhaps these changes of the endothelium have some pathogenic relation to the hepatic abscess which so often accompanies chronic dysentery, p. 581, *op. cit.* I may add that the observations of KELSCH were to some extent noticipated by CORNIL—*Note sur l'anat. path. des ulcerations intestinales dans la dysenterie*, same Volume, p. 311; see also Comptes rendus de la Soc. de Biologie, T. V, 1873, p. 97—who has given four wood-cuts which very fairly represent the conditions in question as seen in a case of chronic dysentery. He recognized that the branching cystic forms in question occupied the sites of the closed follicles, and that they were lined by a columnar epithelium, but did not describe the mode in which they originate. Compare CORNIL et RANVIER—*Manuel d'Hist. Path.*, Part. III, Paris, 1876, p. 820.

need be added to the account already given of the nature of this curious affection, and of the usual appearances presented by the diseased follicles. It remains, however, to be explained that the remarkable form of cystic disease of the colon, described and figured in a previous part of this Section,* is in fact due to an extreme degree of this very process.

Figure 22 represents one of a series of cuts through one of the colon-cysts of case 900. The cyst was cut from a portion of No. 603, Medical Section, the specimen represented in the plate facing page 514. It was about one-twelfth of an inch in diameter, and lay in the thickened submucosa, pushing the mucous membrane upwards so as to form a convex elevation. In the mucous membrane covering this convex surface the glands of Lieberkühn lay obliquely, compressed against each other, and in some places quite flattened.

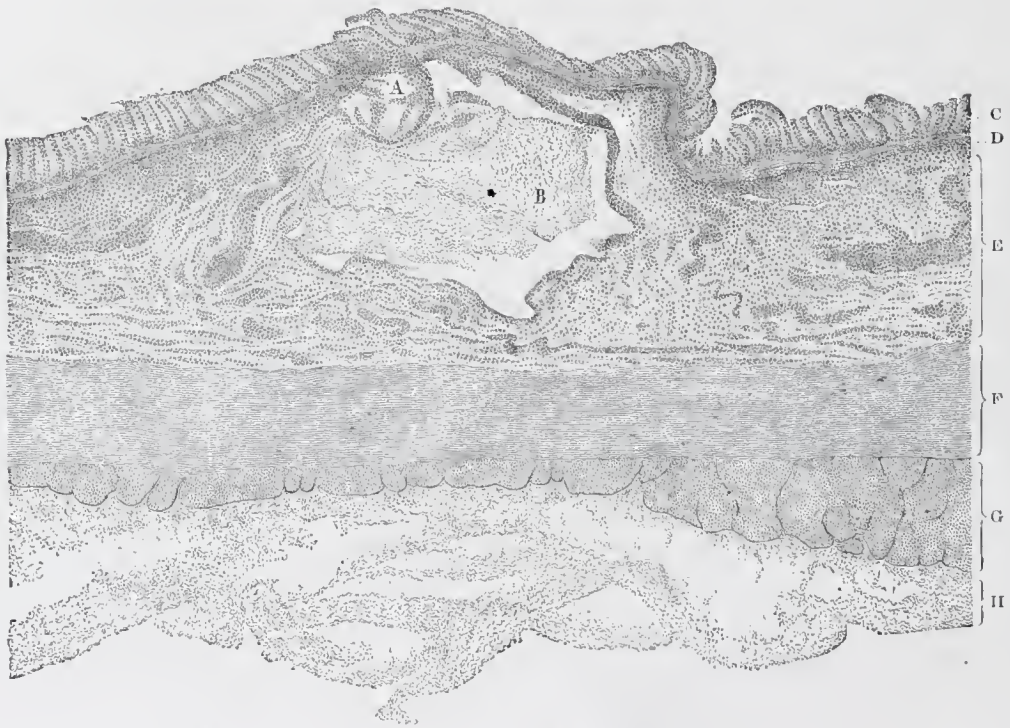



FIG. 22.—Perpendicular section through a cyst of the colon. Magnified 25 diameters by Beck's 3-inch. Copied from a photo-micrograph (Neg. 965, N. S.) of No. 7272, Microscopical Section. A. is the point at which the contents of the cyst become continuous with the lower portion of the glands of Lieberkühn. B. Glue-like mass filling the greater part of the cyst; the action of alcohol has caused it in many places to shrink away from the cyst-walls. C. Mucosa. D. Muscle of Brücke. E. Submucous connective tissue infiltrated, especially in the neighborhood of the muscle of Brücke and in the course of the venous radicles, with swarms of lymphoid cells. F. Circular muscular coat of the colon. G. Longitudinal muscular coat; on the right the edge of one of the ligamenta coli. H. Subperitoneal connective tissue.

At one point in this area the muscle of Brücke was absent, and the contents of the cyst became continuous with the lower portion of the tubular glands of Lieberkühn, (A.) The greater portion of the cyst was filled with a substance which, with a power of 200 diameters or upwards, appeared faintly granular, and had here and there imbedded in it lymphoid elements like those infiltrating the submucosa or the parenchyma cells of the closed follicles; but in the region surrounding the point at which the cyst-contents became continuous with the lower portion of the glands of Lieberkühn a very characteristic structure was presented. Here, instead of the substance just described, dilated and distorted gland tubules imbedded in a soft granular tissue, infiltrated with innumerable lymphoid cells, could readily be distinguished as the chief structural elements.

* Page 512 *et seq.*, *supra*.

Figure 23 represents the appearances of a small area, $\frac{1}{10}$th of an inch in diameter, selected in this region. The columnar epithelium which lines these gland tubules is precisely like that of the follicles of Lieberkühn in form, but the individual cylindrical cells are about one-third larger than the elements of the glands of Lieberkuhn in the mucous layer of the same piece; whence it appears that an increased size of the individual elements is a factor in the process of outgrowth which occurs in these cases. Sections cut from the colon in cases 173, 433 and 899 exhibit conditions very similar to those just described.*

Considerable variation exists with regard to the extent to which the distended gland tubules can be detected in the contents of the cysts. In some of the smaller cysts they are found in all parts of the mass; in the medium sized and larger ones they can be recognized only in the peripheral portion of the cyst-contents, and not always in all parts of this. An examination of the series of sections prepared from the four cases leaves no doubt in my mind that these cysts are formed precisely like the smaller ones described in connection with acute dysentery; in fact, in some of the sections various transition forms between the conditions already figured and such as are represented in Figs. 22 and 23† can be seen. I agree, therefore, with Virchow‡ when he declares the cysts of colitis cystica polyposa to result from cyst-like dilatation of the glands of Lieberkühn and the subsequent irregular coalescence of the smaller cysts thus produced, but I also agree with Cruveilhier,§ that the cysts have their seat in the solitary follicles. In catarrhal inflammation of the intestinal mucous membrane the softened parenchyma of the swollen solitary follicles offers a suitable nidus for the peculiar cyst-like development of the glands of Lieberkühn, which elsewhere is prevented from going beyond a very moderate degree by the resistance offered by the muscle of Brücke; and whether the cystic transformation of the hypertrophic gland tubules proceeds to a moderate or an extreme degree, the parenchyma of the solitary follicles is the site in which the cystic development occurs. The contents of the larger cysts, therefore, are partly the altered parenchyma of the solitary

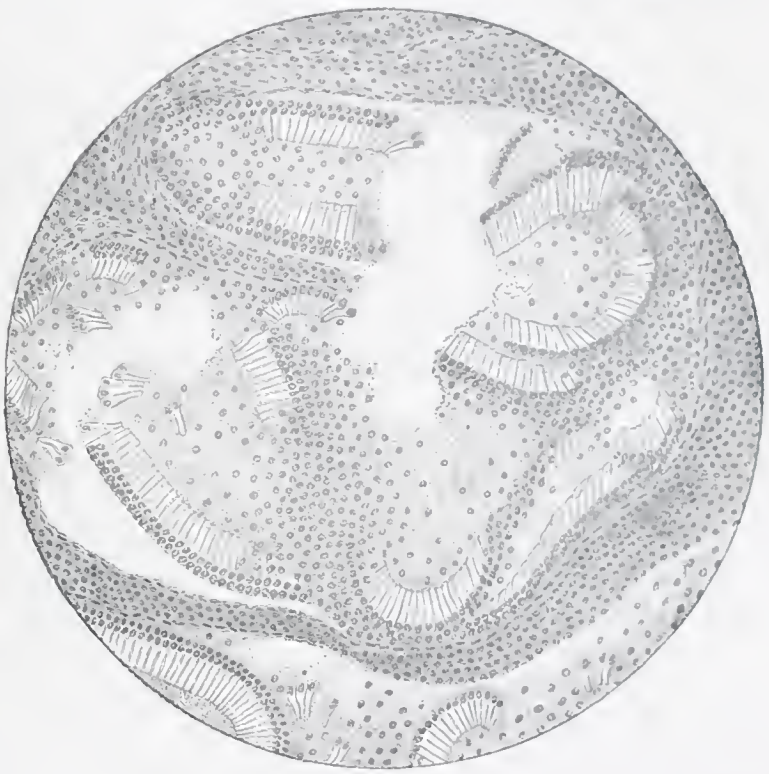


FIG. 23.—View of part of the region marked A in the section represented in the last figure, showing dilated and distorted gland tubules lined by a columnar epithelium similar to that of the glands of Lieberkühn. Magnified 200 diameters by Powell & Lenland's ¼ immersion. Copied from a photomicrograph, (Neg. 940, N. S.) The space between the gland tubules is filled with a granular tissue densely infiltrated with lymphoid cells. The delicate granular substance in the interior of the dilated tubules, in which lymphoid elements are less numerously scattered, closely resembles the substance described in the text as filling the greater part of the cyst.

* Some of these sections have been preserved in the Microscopical Section of the Museum, viz: From case 900, No. 603, Med. Sect., Nos. 7272–3, Mic. Sect; from case 899, No. 660, Med. Sect., Nos. 7274–5, Mic. Sect.; from case 433, No. 527, Med. Sect., Nos. 7270–1, Mic. Sect.; from case 173, No. 56, Med. Sect., Nos. 7216–18, Mic. Sect. † Compare Figs. 9 and 10, *supra*. ‡ See note * to p. 511 *supra*. § See note ‖ to p. 511 *supra*

follicles involved, partly the branches of the hypertrophic glands of Lieberkühn which have undergone the cystic change, but chiefly the modified mucous secretion which has accumulated in these cystic dilatations.

When such cysts rupture and discharge their contents, the cavities left closely resemble ordinary follicular ulcers. Such cavities are seen in several of the sections under consideration. When the section passes on either side of the centre of an unruptured cyst, it appears as if situated in the submucosa and entirely detached from the mucous membrane, while in a central cut the connection of the cyst-contents with the glandular layer can be plainly seen. Fig. 24 is an outline, traced from a photograph of one of the sections from

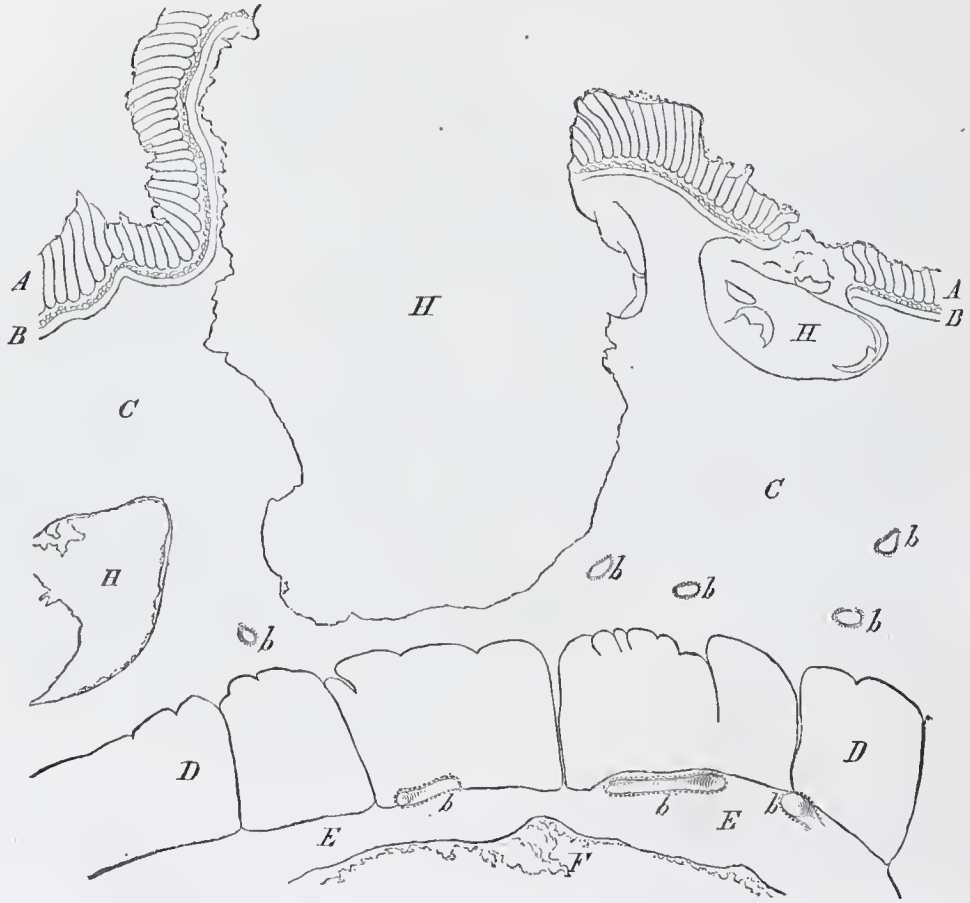



FIG. 24.—Outline of a perpendicular section through three cysts of the colon, traced from a photo-micrograph (Neg. 936, N. S.) of No. 7216, Microscopical Section, (colon of case 173.) Magnified 20 diameters. A. Mucosa. B. Muscle of Brücke. C. Submucosa; *b*, *b*, *b*, *b*, bloodvessels cut across. D. Circular muscle of the intestine. E. Longitudinal muscle. F. Subperitoneal connective tissue. H, H, H. The three cysts described in the text.

case 173, which shows all three of these conditions. The contents of the central cyst had escaped, while those on each side were filled; of these, that on the left hand appears as if deeply imbedded in the submucosa simply because the section passed on one side of the point at which it was connected with the glandular layer of the mucosa; the smaller one on the right hand shows this connection, because the section passes nearly through its centre.

2. *Follicular ulceration.*—The first step in the process of follicular ulceration is the enlargement of the solitary follicles by the accumulation of lymphoid elements in their parenchyma, which has already been described.* The extent to which this process goes on

* Page 326 *et seq.*, *supra*.

before ulceration begins varies in different cases. It has already been remarked* that in the small intestine the enlarged follicle often protrudes beyond the mucous surface as a pedunculated tumor or tiny polypus before ulceration occurs, while in the colon the follicle usually begins to ulcerate before any considerable enlargement has taken place. The latter rule, however, is not invariable, and occasionally the solitary follicles of the colon attain the size of bird-shot before they begin to ulcerate. The following description will be limited to follicular ulceration in the colon, for the process in the small intestine is so similar to the ulceration of the solitary follicles in certain cases of typhoid fever, that the reader may be referred to the account of that process to be presented in the chapter on fever.

The ulcerative process in the enlarged colon follicles begins in one of two ways: In the first case the central portion of the little tumor softens, the reticulum of its parenchyma becomes granular, loses its cohesion, liquefies, the lymphoid elements are set free as pus corpuscles, and a small abscess results, which ruptures at its apex, the drop of pus escaping upon the mucous surface, leaving a tiny cavity, which is the follicular ulcer. In the second, ulceration begins at the apex of the enlarged follicle by the formation and separation of a minute slough, or by the liquefaction of the reticulum and the floating away of the lymphoid elements as pus corpuscles; in this way it invades the follicle from the surface, with the same ultimate result as before. In either case the process continues until the whole follicle is ultimately destroyed. Meanwhile, however, a dense swarm of lymphoid elements has accumulated in the lymph sinuses which bound the follicle, and in the adjacent connective tissue. This infiltrated tissue is progressively invaded by the ulcerative process, the intervening tissue elements continually liquefying and the lymphoid elements floating off as pus corpuscles. In this manner the ulcer extends in the submucous connective tissue; its advance always preceded by a progressive infiltration of the lymph-spaces with lymphoid elements, which gives to its walls many of the characteristics of granulation tissue. At its margins an overhanging edge is formed by the undermined mucous membrane, which continually undergoes necrotic changes because its nutritive supply from beneath is cut off. By this double process the ulcer gradually becomes larger and larger, until, after a time, adjoining ulcers begin to coalesce, forming irregular excavations, which may ultimately attain considerable dimensions, but which, as a rule, preserve, throughout all stages of their progress, the overhanging edges that characterized them at first.

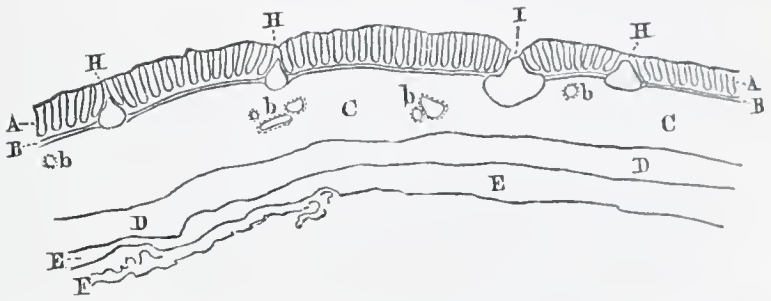



FIG. 25.—Diagram explanatory of the plate facing page 568. A. Mucous membrane. B. Muscle of Brücke. C. Submucous connective tissue; *b, b, b*, distended bloodvessels cut across. D. Circular, E. longitudinal, muscular coat; the latter, on the right, passes through one of the ligamenta coli. F. Subperitoneal connective tissue. H, H. Nearly normal solitary glands. I. Solitary gland enlarged and ulcerated at its apex.

The steel engraving facing page 568 is a copy of a photo-micrograph which represents a comparatively early stage of this process as seen with a magnifying power of 12 diameters. The section photographed, which has since spoiled, was cut from a boiled preparation, stained with yellow aniline, and mounted in gum and glycerine. It belonged to the same series of cuts as Nos. 653 to 658, Microscopical Section, and exhibited similar conditions.

* Page 306, *supra*.

The piece was taken from the colon of a soldier who died in Washington during 1864 of a chronic flux. Well marked follicular ulcers were found in some parts of the large intestine; in others the process appeared to be just beginning. No other particulars with regard to the history of the case were preserved. The portion of the section represented in the plate shows three nearly normal solitary follicles, and a fourth considerably enlarged, which is beginning to ulcerate at its apex. The submucous connective tissue is somewhat thickened, and contains an abundant swarm of lymphoid elements, especially in the vicinity of the muscle of Brücke. Its venous radicles are distended with coagulated blood.

A portion of another section from the same intestine, No. 658, Microscopical Section, is represented in the plate facing page 570, which is reproduced from a photo-micrograph, magnified 63 diameters by a Beck's $\frac{2}{3}$ objective. The design of this plate is to exhibit with a higher power the condition of the submucosa shown with a low power in the last plate. In the portion represented there is a considerable accumulation of new elements in the adenoid tissue of the mucosa, by which the glands of Lieberkühn are pushed preternaturally apart. Two nearly normal solitary follicles are also shown. The submucous connective tissue, increased to about .036 of an inch in thickness, is infiltrated by numerous lymphoid elements which become more and more abundant as the muscle of Brücke is approached; they appear in the plate as circular or oval dots. A number of small bloodvessels filled with coagulated blood are also seen, cut across at various degrees of obliquity.

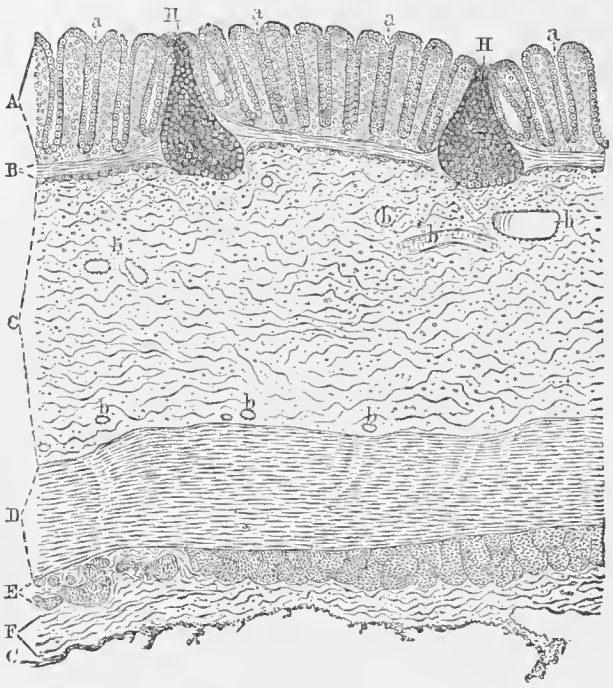
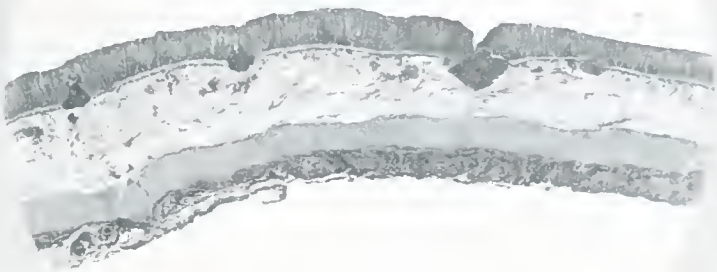



FIG. 26.—Diagram explanatory of the plate facing p. 570. A. Mucous membrane; *a*, *a*, *a*, *a*, glands of Lieberkühn. B. Muscle of Brücke. C. Submucous connective tissue infiltrated, especially near the muscle of Brücke, with lymphoid elements; *b*, *b*, *b*, *b*, bloodvessels cut across filled with coagula. D. Circular, E, longitudinal, coat of the intestine; in the latter, on the right, the cut passes through one of the ligamenta coli. F. Subperitoneal connective tissue. G. Peritoneal epithelium. H. H. Two solitary follicles.

A somewhat similar condition of the submucous connective tissue is exhibited in the plate facing page 572, which also shows an enlarged solitary follicle in which ulceration has fairly commenced. This plate is reproduced from a photo-micrograph of No. 6102, Microscopical Section, magnified 70 diameters by a Beck's $\frac{2}{3}$ objective. The section is one of a series of cuts from the colon of an infant who died of catarrhal inflammation of the intestinal mucous membrane in September, 1873.* The tissue was first hardened by alcohol, and the sections having been stained with carmine were mounted in Canada balsam.

* The child was treated at the Columbia hospital dispensary, Washington, D. C., service of Dr. S. C. BUSEY, who has kindly furnished an account of the case, of which the following is an abstract: E. B——, a male mulatto child, aged 18 months, came to the dispensary Aug. 18, 1873. He was very much emaciated; pulse very feeble; had no teeth, but the lower incisors were advancing; anterior fontanelle enlarged and depressed. Weaning was commenced a week before, but from birth the child had been fed on corn starch, arrow-root, occasionally meat and milk, besides the nourishment derived from its mother, who was at service and could only nurse it twice a day. The child was said to have been plump and fat when first taken sick, which was three weeks previously. The disease began with nausea, vomiting, purging and fever. When first admitted the child had three or four watery, offensive, paioful stools daily, and as many during the night; was very thirsty; had but little appetite, some nausea; rolled its head; skin very dry and shrivelled; abdomen retracted and tender. He did not improve under treatment, and died September 11th. One of the lower incisors protruded August 23d. Nos. 6111–16, Microscopical Section, are a series of perpendicular sections from the small intestine, and Nos. 6102–8 from the colon of this case. In the colon the closed follicles were enlarged and some of them ulcerated; those of the ileum were also enlarged but not ulcerated, and some infiltration of the submucosa with lymphoid elements was also observed in this portion of the intestine.



The submucous connective tissue in the portion of the colon represented in the plate had attained .025 of an inch in thickness, and exhibits the lymphoid swarm very much as it is shown in the last plate; it shows also a number of bloodvessels cut across. In the mucous membrane the glands of Lieberkühn are pushed apart by the accumulation of lymphoid elements in the adenoid tissue. But the most conspicuous feature of the plate is the representation of an enlarged and ulcerated solitary follicle near the middle of the upper portion of the piece; its base protrudes downward into the submucous connective tissue, while its apex and central portion have been destroyed by ulceration. The lymph sinuses, which flank its inferior margin, are nearly empty, but in the connective tissue just below, and on each side, there is a dense swarm of lymphoid elements. This follicle had not been invaded by the adjoining glands of Lieberkühn, and a number of the other ulcers seen in sections cut from the same colon were in a similar condition. In some of the other follicles, however, both in those that were not ulcerated and those that were, this remarkable lesion was conspicuously displayed.

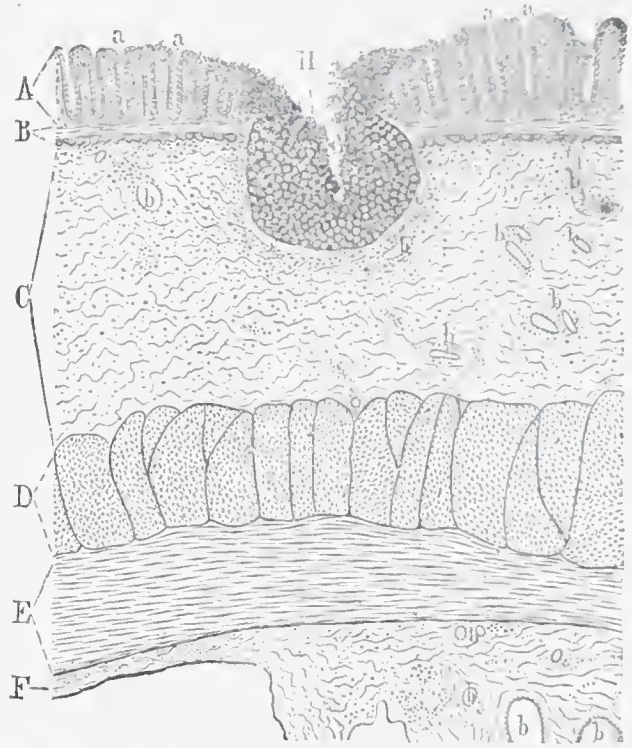



FIG. 27.—Diagram explanatory of the plate facing page 572. A. Mucous membrane; *a, a, a, a*, glands of Lieberkühn pushed apart by the lymphoid swarm in the adenoid tissue of the mucous membrane. B. Muscle of Brücke. C. Submucous connective tissue; *b, b, b, b*, bloodvessels cut across; *c, c*, lymph sinuses beneath the enlarged solitary follicle. D. Circular, E. longitudinal, muscular coat of the intestine; their arrangement shows the cut to have been a longitudinal one. F. Subperitoneal connective tissue, which, in the right of the plate, passes into the mesocolon; in the latter some bloodvessels, *b, b, b*, are seen cut across. H. Enlarged and ulcerated solitary gland.

The general characters of this invasion of the solitary follicles by the adjacent tubular glands and the microscopical appearances to which it gives rise when diphtheritic dysentery supervenes, or when, in certain rare cases, the resulting cystic forms coalesce so as to form compound cysts large enough to be recognized by the unaided eye, have already been described, and it has been shown that the whole process essentially belongs to chronic catarrhal inflammation.* We have now to consider the histological characters that may be observed after ulceration has attacked a solitary follicle which is already the seat of this peculiar morbid condition.

As mentioned, excellent illustrations of these appearances were presented by some of the follicles in the case just described. One of these, in which ulceration had not occurred, was represented in Fig. 9. Another, in which ulceration had already commenced, is shown in Fig. 28, on the next page, which is copied from a photo-micrograph of a part of No. 6105, Microscopical Section. In this instance, while the summit of the enlarged gland has been destroyed by ulceration the cystic forms are distinctly seen in the intact portions of the follicle. The neighboring glands of Lieberkühn are well pushed apart by the swarm of lymphoid elements in the adenoid tissue of the mucosa; in the submucous connective tissue these elements are most abundant in the vicinity of the muscle of Brücke and of the blood-

* See p. 465 *et seq.*, and p. 563 *et seq.*, *supra*.

vessels. In yet other solitary follicles in some of the same sections the ulceration has penetrated more deeply, in some of them destroying a considerable portion of the cystic forms, the remains of which can, however, be distinctly recognized at the bottoms of the ulcers.

These conditions can also be seen in many of the specimens of follicular ulceration of the colon collected during the civil war and preserved in the Museum. In perpendicular sections of such colons it will very often be found that the majority of the ulcers have quite destroyed all the textures belonging to the solitary follicles; but between these fully formed ulcers others will often be found in which more or less of the parenchyma of the follicle has as yet escaped destruction, and in this the distorted gland tubules and cystic forms we have been considering are often encountered.

Fig. 29, on the next page, represents a perpendicular section through such a follicle, seen with a power of 75 diameters by a Beck's ⅔ inch objective. The section was obtained from the colon of case 873.* The coats of this colon varied from one-tenth to one-eighth of an inch in thickness, of which the thickened submucosa constituted nearly one-half; the muscular coat was also greatly thickened, the thickening residing chiefly in its circular layer, and in part, no doubt, due merely to contraction, but in part to an infiltration of its connective-tissue trabeculæ with lymphoid elements. Numerous follicular ulcers were scattered over the mucous surface. Some of these were rounded or oval, punched-out ulcers, penetrating quite to the circular muscular layer, and varying from one-twentieth to one-tenth of an inch in transverse diameter; but the greater number of the ulcers were much smaller, and many of them presented the conditions shown in the figure. In these a portion of the parenchyma of the enlarged follicles was not yet destroyed, and in this portion gland tubules and cystic forms lined by a columnar epithelium, the remains of the branching glands of Lieberkühn, which in the earlier stages of the process had invaded the follicles, could be plainly made out. The thickened submucous connective tissue was infiltrated with innumerable lymphoid elements, which were so abundant in the immediate vicinity of the ulcerated solitary follicles as quite to obscure their peripheral limitation. In this border-territory minute hæmorrhages had occurred at some former period, for numerous yellowish-brown granular masses of hæmatin were observed between the cellular forms. In those parts of the submucous layer in

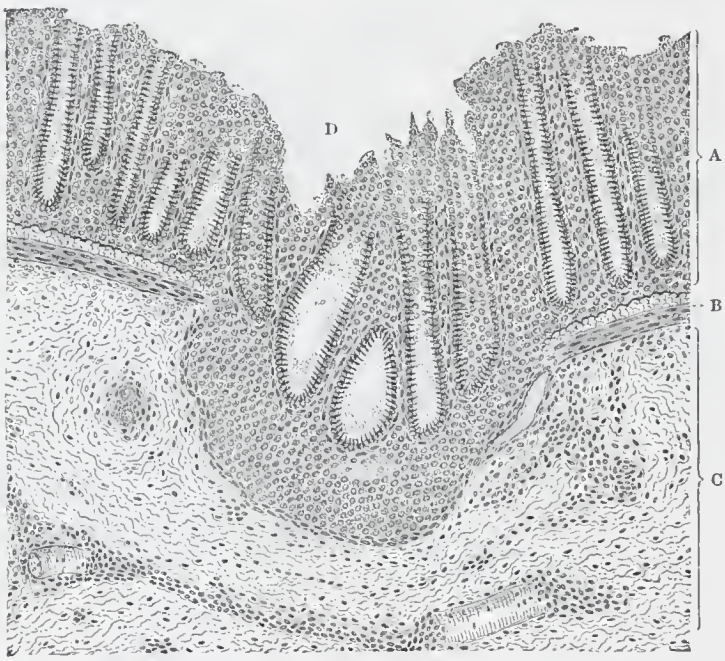
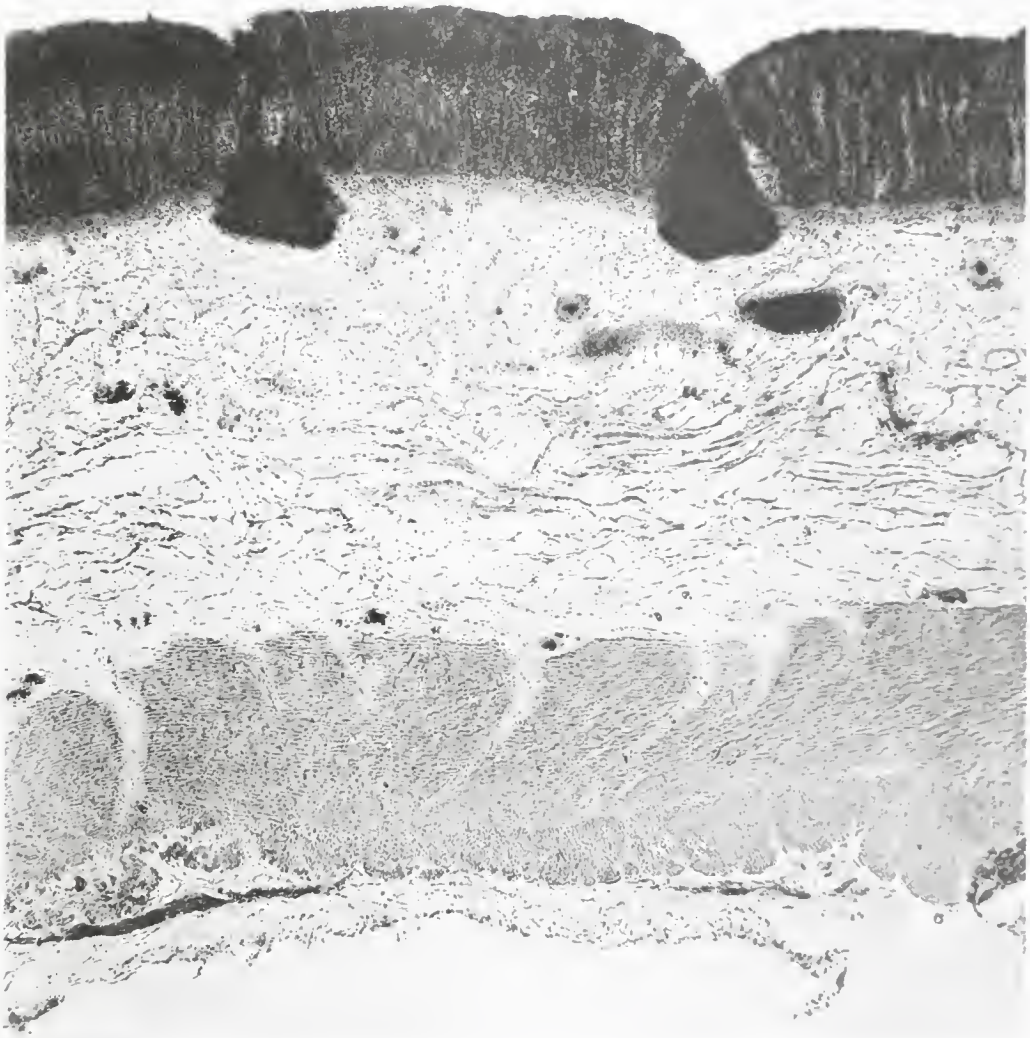



FIG. 28.—Perpendicular section of the colon of a child, cut longitudinally. Magnified 100 diameters by Powell and Lealand's ½ inch objective. Copied from a photo-micrograph, (Neg. 925, N. S.) A. Mucous membrane. B. Muscle of Brücke. C. Submucous connective tissue. In the centre of the piece, below D, is an enlarged solitary gland ulcerated at its apex, and showing cystic forms in its deeper part.

* See p. 262, *supra*. Nos. 7288–92, Microscopical Section, were cut from the transverse colon in this case. They were taken from a portion hardened in alcohol, and were subsequently stained with carmine and mounted in Canada balsam.



*Heliotype.* *James R. Osgood & Co., Boston.*

PERPENDICULAR SECTION OF COLON.

Showing commencing ulceration of the solitary glands, and inflammation of the submucous coat.
Magnified 63 Diameters.

PHOTO-MICROGRAPH BY DR. T. J. WOOLWARD, U.S.A.

From No. 658. MICROSCOPICAL SECTION.

which the lymphoid elements were least abundant the characteristic enlargement of the endothelial connective-tissue corpuscles into large granular cells* could be plainly seen, but in other portions of the layer these were quite obscured by the innumerable lymphoid elements. The glandular layer of the mucous membrane where least diseased was a good deal thickened in consequence of the infiltration of its adenoid tissue with lymphoid elements, besides which in many places its superficial portion was destroyed by ulceration, and this was particularly the case in the immediate vicinity of the follicular ulcers.

The invasion of the closed follicles by the adjacent glands of Lieberkühn, although exceedingly frequent, is, however, by no means an invariable concomitant of the process of enlargement which precedes their ulceration; and even when it occurs, the characteristic appearances are speedily quite destroyed by the ulcerative process, so that no traces of them are found in thin sections through the majority of fully formed follicular ulcers. The conditions then presented are illustrated on the next page by Fig. 30, which represents a perpendicular section through a small follicular ulcer as seen with a power of 26 diameters. The figure is copied from a photograph of a portion of No. 684, Microscopical Section, the whole of which, as seen with a power of 12 diameters, was represented in Circular No. 6 by a lithographic plate.† Nothing has been preserved with regard to the history of the case, except that it was one of chronic dysentery in which follicular ulceration of the colon was found after death. It will be observed that the ulcer has penetrated to the circular muscular coat, the surface of which, however, is coated with a thin layer of granulation tissue. On the right, it has burrowed beneath the glandular layer of the mucous membrane which thus forms an overhanging edge; on the left, at the edge of the ulcer, the glandular layer is pulled down towards the muscular coat as though by the contraction of the granulation

FIG. 29.—Perpendicular section through a follicular ulcer of the colon. Magnified 57 diameters. Copied from a photo-micrograph, (Neg. 964 of No. 7291, Microscopical Section, N. S.) A. Mucous membrane, its surface partly destroyed by ulceration. B. Muscle of Brücke. C. Submucous connective tissue much infiltrated with lymphoid elements. D. Cavity of follicular ulcer; *a*, *a*, *a*, *a*, gland tubules and cystic forms derived from the outgrowth of the glands of Lieberkühn. See p. 570.

* See p. 468, *supra*.

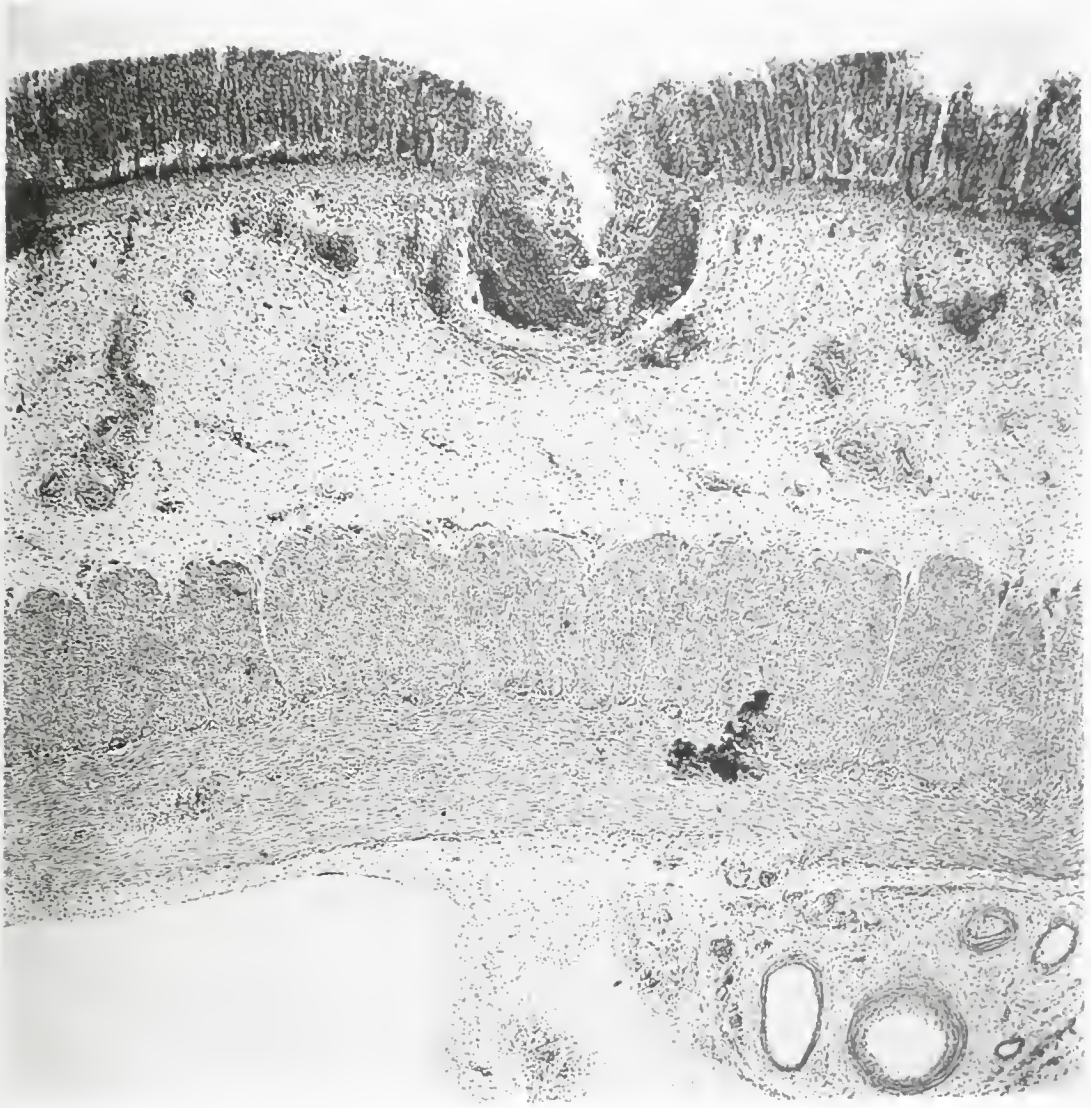
† *Circular No.* 6, Surgeon General's Office, November 1, 1865, p. 150. The preparation is one of a series, Nos. 683–5, Microscopical Section, cut from a boiled piece, stained with yellow aniline and mounted in glycerine in December, 1864. It is one of the few preparations mounted in glycerine about the same time which still show any details. At the date of printing this page, March, 1878, it is still in a tolerable condition. When I wrote the description of the plate in the Circular I still held to the opinion—previously expressed by me in my *Outlines of the Chief Camp Diseases of the United States Armies*, Philadelphia, 1863, p. 247, and in a paper *On the use of aniline in histological researches*, &c., The Amer. Jour. of the Med. Sci., Vol. XLIX, 1865, p. 106 *et seq.*—that the new elements which infiltrate the connective tissue in these cases are derived from the connective-tissue corpuscles by cell-multiplication. This opinion, formed under the influence of the writings of VIRCHOW—*Die Cellularpathologie*, 2te Aufl., Berlin, 1859, Vorlesungen 18 und 19, S. 358 *et seq.*—appeared to be justified by the manner in which the new elements are found in rows and groups, and by the occasional observation of nuclei and individual cells which seemed to be multiplying by division. These latter appearances were, however, by no means constant, and I often spent hours in the vain attempt to find places in which they were shown with sufficient distinctness to serve for photographic representation. I am now satisfied that I was sometimes misled, by the juxtaposition of a connective-tissue cell with one or more lymphoid elements, into the belief that I had actual cell-multiplication before me; but I am by no means convinced that this was always the case, or that no multiplication of the elements of these inflamed tissues ever occurs. But the groups and rows of cells which, in common with so many others, I regarded as abundant proof of cell-multiplication, I am now convinced are produced chiefly by the accumulation of the new elements in lymph spaces of various sizes and forms.

tissue. The submucous connective tissue is infiltrated with great numbers of lymphoid elements, which are most numerous near the edges of the ulcer, where they are so abundant that they appear to replace all the other elements.

The plate facing page 574 represents a section through one margin of a larger follicular ulcer as seen with a higher power. It is reproduced from a photo-micrograph of No. 705, Microscopical Section, (erroneously lettered No. 711 on the plate,) magnified 63 diameters by a Beck's $\frac{2}{3}$ inch objective. The specimen is one of a series of perpendicular sections (Nos. 703 to 710, Microscopical Section) of a portion of the colon of a soldier who died of chronic dysentery in Washington during 1864. They were cut from a boiled piece, stained with yellow aniline and mounted in gum and glycerine. On the left of the upper surface of the piece shown in the plate is a slightly enlarged solitary follicle, at the apex of which ulceration has just commenced. On the right, the section passes into a follicular ulcer with an overhanging margin, the opposite margin of which is not shown. From margin to margin this ulcer measured nearly one-fifth of an inch across. The adenoid tissue of the mucous membrane is infiltrated with great numbers of lymphoid elements by which the glands of Lieberkühn are pushed considerably apart. These glands show slight cystic distention in their inferior portions. The apices of some of them are concealed by the lymphoid swarm. Innumerable lymphoid elements are seen also in the submucous connective tissue; they are most abundant in the vicinity of the ulcer and in the portion of the submucous connective tissue nearest to the muscle of Brücke. In the latter situation they are so numerous that no definite arrangement can be discerned, while elsewhere they appear in groups, whose outline is determined by the form of the lymph spaces in which they are contained. Ulcers of this kind seldom extend beyond the deeper portions of the submucous connective tissue, and their bottoms are usually separated from the circular muscular coat by a thin layer of granulation tissue, consisting of lymphoid elements adhering together by a scanty granular matrix. Occasionally, however, the muscular coat of the bowel is invaded by the ulcer, which may then penetrate to almost any depth. I do not even doubt the possibility of actual perforation, though I have never seen an example except in those cases in which follicular ulceration is complicated by the diphtheritic process.

FIG. 30.—Perpendicular section through a portion of No. 684, Microscopical Section, showing a follicular ulcer of the colon; from a photo-micrograph, (Neg. 912, N. S.) The scale is in $\frac{1}{100}$ and $\frac{1}{1000}$ of an inch. See p. 571.

The minute changes which accompany the invasion of the muscular coat by follicular ulcers are so similar to those which occur during its invasion by spreading diphtheritic



*Heliotype.*

PERPENDICULAR SECTION OF COLON,

SHOWING A FOLLICULAR ULCER. MAGNIFIED 70 DIAMETERS.

PHOTO-MICROGRAPH BY ASSISTANT SURGEON J. WOLVERTON, U. S. A.

FROM No. 6102 MICROSCOPICAL SECTION.

ulcers that the description given in connection with the latter* might be repeated here. So also the brief description already given of the process of *cicatrization* in the diphtheritic ulcer† will apply with but little modification to the follicular ulcer. The chief point of difference results from the presence of the overhanging edges in the latter case. During the healing process the granulations first fill up the excavations beneath these edges, and, as they contract, pull the edges down towards the muscular coat. The characteristic appearance of the edges is thus destroyed, and perpendicular sections cut through ulcers in this condition very closely resemble sections of diphtheritic ulcers in the same stage. The appearance and structure of the cicatrices of the large ulcers, which sometimes result from the coalescence and extension of the follicular ulcers, differ, therefore, in nothing from diphtheritic cicatrices. It is only when the cicatrices are numerous and of small size that their origin from follicular ulcers can be inferred, in the manner indicated above,‡ from their macroscopic appearances; in their minute structure they offer nothing characteristic.

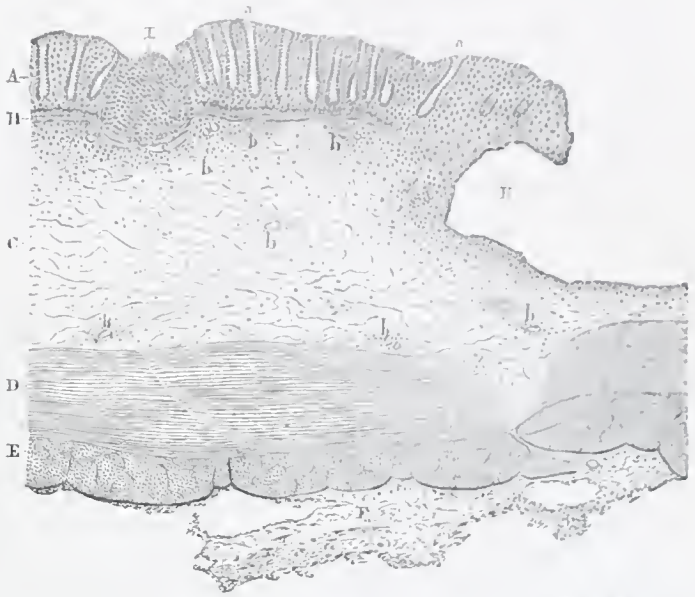



FIG. 31.—Diagram explanatory of the plate facing page 574. A. Mucous membrane; *a*, *a*, glands of Lieberkühn pushed apart by the infiltration of the adenoid tissue with lymphoid elements. B. Muscle of Brücke. C. Submucous connective tissue; *b*, *b*, *b*, distended blood-vessels cut across; *c*, lymph sinus. D. Circular, E, longitudinal, layers of the muscular coat of the intestine. F. Subperitoneal connective tissue. H. Cavity of a follicular ulcer. I. Solitary follicle at the apex of which ulceration has just commenced. See p. 572.

3. *Ulceration unconnected with the solitary follicles.*—The formation of these ulcers is preceded by an accumulation of lymphoid elements in the adenoid tissue of the mucous membrane, by which the superficial portions of the glands of Lieberkühn are finally entirely obscured. The columnar epithelium of the mucous membrane then separates and leaves an abraded surface composed almost wholly of lymphoid elements, and resembling in its appearance the surface of a granulating wound. By more or less rapid molecular changes, commencing at the surface, the reticulum of the adenoid tissue then liquefies and the lymphoid elements float off free as pus corpuscles. The glands of Lieberkühn appear sometimes to be destroyed, like the reticulum, by molecular changes; sometimes to separate as tiny sloughs, but they are usually so obscured by the dense lymphoid swarm that it is difficult to make out the details of their fate. Ulcers of this kind may frequently be observed which have destroyed only the superficial portions of the mucous membrane, and the bases of the glands of Lieberkühn can still be distinguished beneath the ulcerated surface. In other instances the ulcer invades the submucous connective tissue, and may even penetrate to the muscular coat or deeper. In all cases its margins are surrounded by a dense swarm of lymphoid elements, and the ulcer enlarges either by the liquefaction of the tissue infiltrated by them, which permits them to float off free as pus corpuscles, or this process is accelerated by the separation from time to time of larger fragments of the infiltrated tissue as little sloughs.

* *Supra*, p. 481. † *Supra*, p. 482. ‡ Page 519, *supra*.

When the non-follicular ulcers are small, and no indications of the diphtheritic process can be detected in other parts of the colon, it is comparatively easy to determine their nature; but when they attain considerable size, it is not always possible to discriminate. Nor can large and deep ulcers, which have originated in this manner, always be distinguished from follicular ulcers which have spread into large erosions, so that in certain cases of intestinal ulceration it is not possible to determine by an examination of the specimen in which of the three ways the ulcers have arisen. Simple non-follicular ulcers usually occur in connection with ulceration of the follicles. They appear as superficial or deeper erosions of the mucous membrane between the follicular ulcers, and are of various dimensions from mere points to areas which rival diphtheritic ulcers in extent. Occasionally they occur also in cases in which the follicles themselves are not ulcerated.

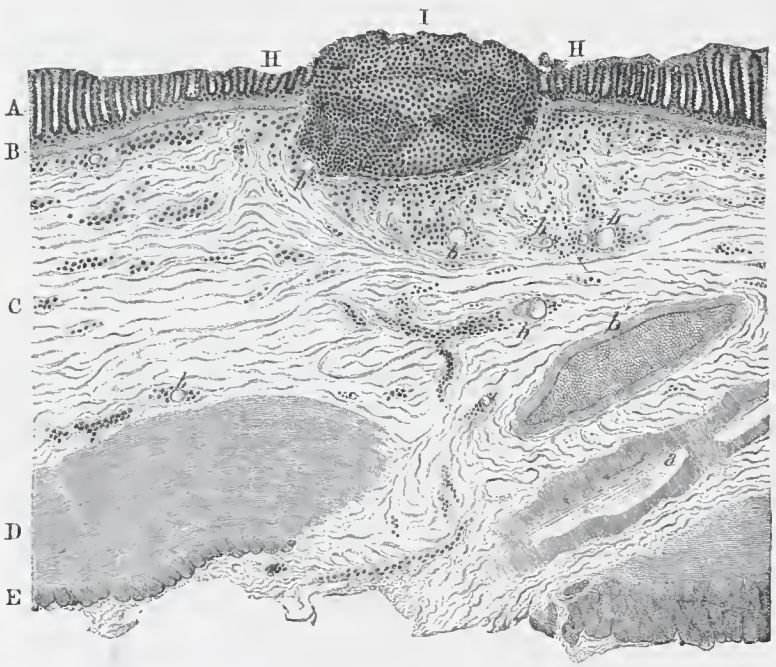


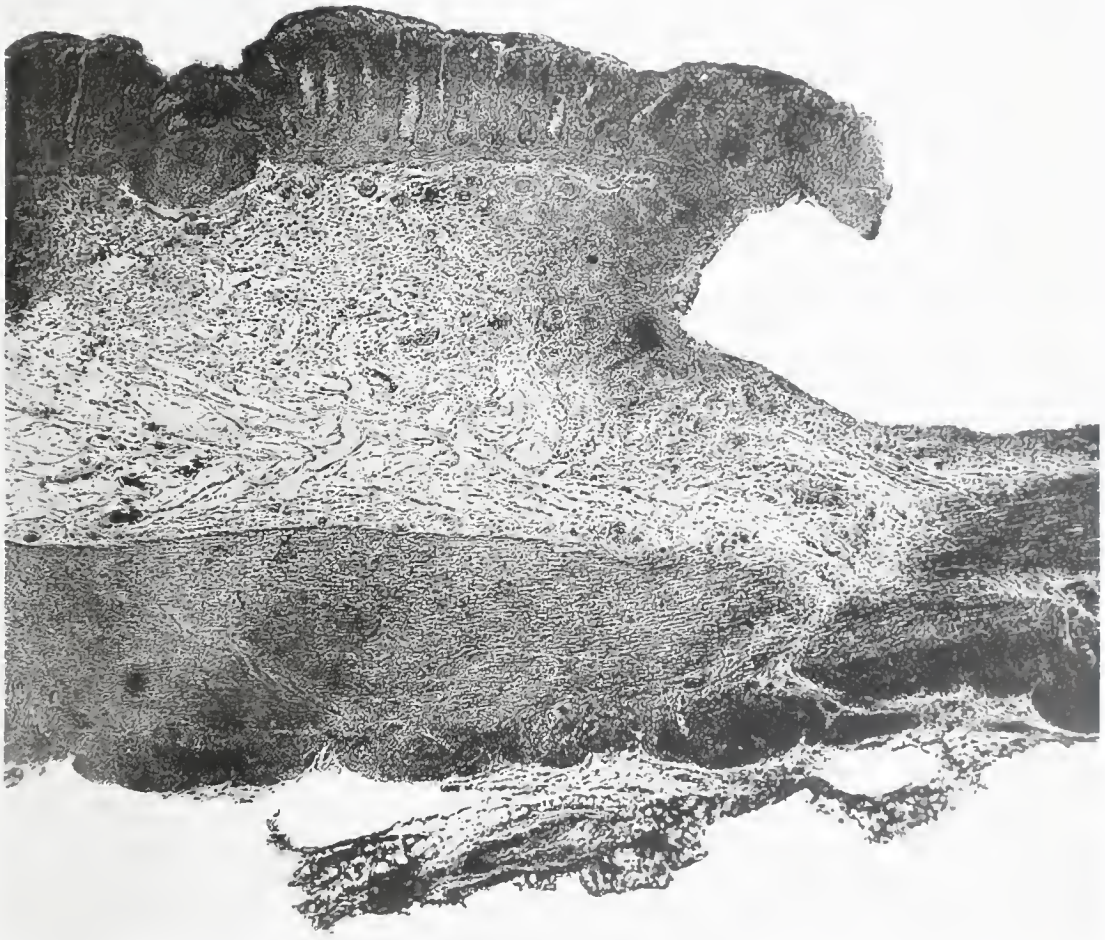

FIG. 32.—Perpendicular section of the colon from case 310, showing a small superficial ulcer H, H, in the centre of which an intact solitary follicle, I, protrudes as a minute nipple-like elevation. Half-diagrammatic drawing from a photograph (Neg. 563, N. S.) of No. 666, Microscopical Section. Magnified 48 diameters. A. Mucous membrane. B. Muscle of Brücke. C. Submucous connective tissue; *b*, *b*, *b*, small veins cut across. D. Circular, E, longitudinal, muscular coats of the intestine; these are divided by the entrance of an artery, *a*, from the mesocolon, which is accompanied by a vein of considerable size and surrounded with connective tissue.

A curious example of this occurrence is afforded by the colon in case 310,* in which the follicles themselves had not been destroyed by the ulcerative process, although each was surrounded by a minute superficial ulcer. Figure 32 is a half-diagrammatic drawing from a photograph of a perpendicular cut through one of these ulcers, No. 666, Microscopical Section. An enlarged solitary follicle, I, is seen intact near the centre of its upper surface; on each side of this there is a limited erosion, H, H, which has destroyed about one-half the thickness of the mucous membrane. A swarm of lymphoid elements is seen in the submucous connective tissue just below the muscle of Brücke, around the enlarged solitary follicle, and around the smaller veins. The colon in this case contained a great number of ulcers resembling that here figured. When seen from above each resembled a tiny circular superficial excavation, in the centre of which the enlarged solitary gland protruded as a tiny nipple-like elevation.

The histological details of the process of cicatrization in the non-follicular ulcers differ in no important particulars from what occurs in the erosions produced by the separation of diphtheritic sloughs, so that nothing need be added here to what has already been said in connection with the histology of diphtheritic dysentery.†

* See pp. 151 and 516, *supra*. No. 406, Medical Section, is a portion of the descending colon in this case, which was one of subacute flux accompanied by subcutaneous abscesses and erysipelas; death occurred 2½ months after the commencement of the disease. Nos. 659–67, Microscopical Section, are a series of cuts of this colon, from a boiled piece, stained with yellow aniline and mounted in gum and glycerine.

† See p. 482, *supra*.



*Heliotype.* *James R. Osgood & Co., Boston.*

PERPENDICULAR SECTION OF COLON

THROUGH THE EDGE OF AN ULCER. Magnified 63 Diameters.

PHOTO-MICROGRAPH BY ASSISTANT SURGEON J. J. WOODWARD, U. S. A.

From No. 711. MICROSCOPICAL SECTION.

### 4. Diarrhœa connected with tubercular ulceration of the intestines.

This group of cases, as already explained,* was established for anatomical reasons, the clinical phenomena being, in the present state of our knowledge, inadequate to do more than indicate the probable existence of the lesions in question. Tubercular disease of the intestines may occur as one of the lesions of general acute miliary tuberculosis, in which event the patient often perishes before the stage of ulceration is reached. It also occurs in connection with extensive tubercular disease of the abdominal organs manifested as tubercular peritonitis, associated with tubercular disease of the retro-peritoneal and mesenteric glands and of one or more of the great abdominal viscera, occurring in individuals whose lungs are not primarily affected, or even remain quite healthy until the fatal issue; these cases are characterized by the symptoms of chronic peritonitis for the most part complicated with ascites; after a time obstinate diarrhœa sets in, and on dissection, besides the lesions of intestinal catarrh, tubercular ulceration of the intestines is often found. But by far the most frequent form of tubercular disease of the intestines, and the only one that will be discussed in this place, occurs in the advanced stages of tubercular consumption of the lungs and frequently gives rise to extensive intestinal ulceration.

That obstinate diarrhœa often sets in during the later stages of lung phthisis and exercises no slight influence in producing the exhaustion of the patient and the fatal issue, was long known to physicians;† but even after lung tubercles began to be observed in dissections of subjects dead of phthisis‡ the intestinal flux continued to be attributed to a

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* *Supra*, p. 265.

† Thus Hippocrates—*Aph.* V, 14, [Ed. Littré, T. IV, p. 537,]—declares that diarrhœa supervening in a patient laboring under phthisis is a mortal symptom.

‡ Otto Heurnius—*Hist. et obs. quædam rariores ex praxi et diario*, Hist. 21: appended to Fernelii *Universa Medicina*, Geneva, 1679—appears to have been the first to observe on dissection an unquestionable example of what we now call miliary tubercles. He relates that on the 7th of January, 1639, he dissected the body of a Scotchman, aged 28, dead of tabes, the whole parenchyma of whose lungs was filled with minute tubercles: "Deprehendimus tabificam mortis causam in pulmone resedisse, quippe totum parenchyma minutis tuberculis ex cruda viscosa materia oppletum erat." Sylvius—*Praxeos Med.*, Lib. I, Cap. 24, p. 220, and *Appendix, Tract.* IV, *De Phthisi*, p. 689, in Opera, Amsterdam, 1679, (Lib. I of the Prax. Med. first appeared in 1667, and the appendix, containing Tract IV, posthumously in 1674)—appears to have been the first to frame a theory of lung phthisis that included as one of its forms the development of smaller or larger tubercles in the lungs, which by central softening produce vomicæ. He based this opinion upon his own dissections, and regarded the hereditary disposition to phthisis as due to these tubercles: "Ut proinde, quid mihi observare contigerit, proferam, et quid mihi proinde vomica sit, candide communicem. Vidi non semel glandulosa in pulmonibus tubercula minora vel majora, in quibus aliquando pus varium contineri, sectio manifestavit. Hæc proinde tubercula sensim in pus abeuntia, et membrana sua tenui conclusa pro vomicis habenda existimo, ab illis saltem non infrequenter phthisin ortum habere deprehendi. Quinimo in hisce tuberculis, si in re ulla alia sensibus externis patente, dispositionem illam ad phthisin familiis certis hæreditariam, letbalemque constituere non verebor: solent enim illa tubercula cum ætate augeri, atque sensim ad suppurationem pergere," Tract. IV, Appendix, § 51 and 52, p. 692, Opera, Ed. cited *supra*. It would require too much space to discuss here the older views with regard to lung phthisis. Let it suffice that it has been shown with great probability by Virchow—*Phymatie, Tuberculose und Granulie, Eine historisch-kritische Untersuchung*, Virchow's Archiv, Bd. XXXIV, 1865, S. 18 *et seq.*—that the word φῦμα, applied by Hippocrates to certain morbid conditions of various organs, and translated in the oldest Latin versions by the word tuberculum, was really intended to signify for the most part merely an abscess of no inconsiderable size. Waldenburg—*Die Tuberculose*, &c., Berlin, 1869—in his admirable summary of the historical development of the doctrine of tubercle, has taken a very similar view, S. 6 *et seq.* The Latin word tuberculum, as used by Celsus in various passages, signifies merely a circumscribed outgrowth or swelling of moderate size. (Virchow, *loc. cit.*, p. 19.) It was applied to normal processes of the bones, to exostoses, condylomata sebaceous cysts, furuncles and tumors of various kinds. In Lib. V, Cap. 28, § 9, Celsus describes the φῦμα of the Greeks as a kind of tubercle, similar to a furuncle but rounder, flatter and often larger; Virchow thinks he intended to indicate abscesses of the lymphatic glands. Even the striking passage in the Hippocratic treatise *De Articulis*, [Ed. Littré, IV, pp. 179–80,] in which it is declared that hard and crude phymata sometimes develop in the lungs of those who have gibbous spines, is interpreted by Virchow (p. 33) in accordance with the views already explained. The words used in the Latin version of this passage, "tuberculis duris et crudis ad pulmonem obortis," [Ed. Kühn, III, p. 189,] are so similar to the modern expression hard and crude tubercles, that they have naturally been supposed to be identical in meaning as well as in sound. If, however, the view of Virchow is correct, the crude phyma of Hippocrates would be simply an abscess in which suppuration had not yet occurred, and the same explanation must be assigned to the "cruda tubercula" spoken of by various writers as late as the beginning of the seventeenth century. Compare, for example, the observation "de tuberculo pulmonis" by Zacutus Lusitanus—*De Praxi Med. Admir.*, (1634,) Lib. I, Obs. 112, in Opera, Lyons, 1649, T. II—who shows himself fully in accord with the Hippocratic view; or the still clearer exposition of Sennertus—*Pract. Med.*, Lib. II, Pars. 2, Cap. 8, Opera, Paris, 1641, T. II, p. 436—"*De tuberculis pulmonis.* Præter inflammationem pulmonis, de qua supra dictum, quæ fit ex materia in pulmonis substantiam imbibita, et in totum viscus dispersa, etiam tubercula in pulmone generantur ex materia collecta in una parte, et inde extuberante, de quibus agit Hippocrates *lib. I. de morb.* et hoc loco agendum videtur. Sunt autem illa tubercula alia cruda, quorum e. 4. etiam mentio facta est, quæ ex materia, quæ nunquam suppuratur, generantur, quorum meminit Hippocrat. *lib.* 3. *de artic. text.* 9. et Galenus, *in comment. et* 4. *de loc. affect. cap. ultim.* in historia Antipatri, et 6. *aphor.* 45. quæ nunquam ad suppurationem deducta et nulla febre comitante sola magnitudine, cum admodum adaucta est, exclusis in totum spiritus viis ægrum interimunt: alia quæ suppurantur, de quibus præcipue, *allegato modo loco* Hippocrates agit." Compare Cap. 12, "*De ulceribus pulmonum, et phthisi*" in which he derives phthisis from ulceration of the lungs, quite after the doctrine of the ancients, and adds, with regard to the diarrhœa of the later stages: "Supervenit denique his omnibus diarrhœa ex retentricis ventriculi et intestinorum imbecillitate, imo et humorum corruptione," p. 442. D.

general colliquation of the tissues, or to a debility of the intestines, rather than to any organic intestinal lesion.* It is true that the intestines were sometimes found diseased in those dead of phthisis, and even tubercles of the intestine were observed in a few rare cases,† but no great attention appears to have been directed to these lesions prior to the commencement of the present century.‡

The first to give a clear description of the intestinal lesion in these cases was Bayle,§ who found ulceration of the intestine in 67 out of 100 dissections of subjects dead of phthisis. In most of these cases the ulceration was the consequence of a prior formation of intestinal tubercles, and in accordance with the views he entertained with regard to lung tubercle, he discriminated in the case of intestinal tubercles between the semitransparent miliary granulations and ordinary miliary tubercles. After this, observations with regard to tubercles and tubercular ulceration of the intestine multiplied. Without attempting to enumerate them I may refer particularly to the accounts of this lesion by Laennec, Andral, Louis, J. Wagner, Rokitansky, Foerster, Lebert, Klebs, Rindfleisch, Ernst Wagner and Hering.‖ I cannot pause to analyze these observations, but pass on at once to an account of the conditions under consideration as observed during the civil war.

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* See, for example, the treatise of RICHARD MORTON—*Phthisiologia, seu Exercitationes de Phthisi*, London, 1689—who asserts that he had often seen in phthisis hard little tumors (tubercula) seated in the glandulous parts of the lungs, side by side with abscesses and ulcers of other parts of those organs, ("quæ tubercula, sive crudos, et glandulosos tumores, sæpe in phthisicorum cadaveribus deprehendi, eum ceteræ pulmonum partes apostematibus et exulcerationibus essent obsitæ," Lib. II, Cap. 2, p. 73,) and naming this species of the disease scrofulous phthisis. (Lib III, Cap. I, p. 213.) affirmed it to be the most frequent form of the disorder encountered in practice, yet regarded the diarrhœa of the latter stages of consumption simply as the result of colliquation (Lib. II, Cap. 4, p. 119) without appearing to suspect the existence of intestinal tubercles.

† Compare, among the cases of phthisis collected by BONETUS—*Sepulchretum*, Lib. II, Sect. 7—Obs. 63, in which "intestinorum corpus vitiatum erat," and Obs. 103, in which "intestina etiam aliqua ex parte corrupta." The earliest unmistakable case of intestinal tubercles that has been brought to my notice is Obs. 48 of the additamenta which MANGETUS appended to this section of the *Sepulchretum* in the Geneva edition of 1700, T. I, p. 808. This is the case of a young man, aged 17, who died after an illness of about three months, during which loss of strength and appetite, emaciation, cough and obstinate diarrhœa were the prominent symptoms. On the autopsy, July 12, 1690, the lungs were found full of little, whitish, hard bodies about the size of millet seeds: "Tota illorum superficies ante et retro atque intra lobum majorum interstitia conspersa erat corpusculis albis, duriusculis, magnitudine seminis milii, papaveris albi, quædam magnitudine sem. canabis, densissime junctis, vix remanente spatiolo de pulmonum ab illis immuni." These bodies he calls "grandines," (*i. e.*, hail-stones,) a word long previously applied to certain bodies expectorated in phthisis. Besides other lesions, similar "grandines" were found in the liver, spleen, kidneys, mesenteric glands and intestines, in which latter "conspiciebantur glandulæ hinc inde grandinesæ, imprimis solitariæ in colo prope cœcum; ex quibus compressione prodiit humor turbidus, albicans."

‡ For example, PORTAL—*Obs. sur la Nature et le Traitement de la Phthisie Pulmonaire*, Paris, 1809, T. II—who was well acquainted with the existence of tubercles in many other organs than the lungs, Art. IV, p. 303, Note 1, makes no mention of their occurrence in the intestines in his account of the lesions of those dead of phthisis, and explains the diarrhœa of the later stages of that disease by the old doctrine of colliquation, Art. 1, p. 249, regarding it as due to the same cause as the colliquative sweats and the œdema of the lower extremities so often observed.

§ G. L. BAYLE—*Rech. sur la Phthisie Pulmonaire*, Paris, 1810, p. 59: "Sur les 100 phthisiques morts en l'an XII, 33 avoient le conduit alimentaire tout à fait sain. 67 présentoient des ulcérations dans le canal intestinal. Chez quelques-uns des malades dont les intestins sont ulcérés, l'ulcération intestinale est le résultat des granulations miliaires transparentes; mais pour l'ordinaire, ce sont les tubercules miliaires qui déterminent cette affection." The student of the history of tubercle, in which the observations of BAYLE constitute a noteworthy epoch, should consult also his original articles in Corvisart's Jour. de Méd., etc., viz: *Remarques sur les tubercules*, T. VI, an XI, (1803,) p. 3; *Remarques sur l'induration blanche des organes*, T. IX, an XIII, (1805,) p. 285; *Remarques sur la dégénérescence tuberculeuse non enkystée du tissu des organes*, id., 427. In this article his first account of tubercular intestinal ulcers will be found under the head of "Dégénérescence tuberculeuse du tissu des membranes muqueuses." He states that these degenerations affect chiefly the mucous membrane of the larynx and intestine; in the latter case the ileum, cæcum and colon; so commonly does this lesion of the intestines accompany tubercles of the lungs that if it is found in any cadaver it is safe to affirm the lungs will also be found to be tubercular. These ulcers begin as whitish or reddish circular swellings, 3 to 6 lines in diameter, and half a line to a line in thickness; a central point of ulceration then forms in the swelling, which subsequently spreads; the tubercular nature of these ulcers can be recognized from the characters of their edges. Three-fifths of those who die of phthisis have this affection of the intestine, which appears to be the usual cause of the colliquative diarrhœa observed in the last stages of phthisis. The last article of this series is entitled *Suite des remarques sur la dégénérescence tuberculeuse non enkystée du tissu des organes*, T. X, an XIII, p. 32.

‖ LAENNEC—*Traité de l'Auscultation Médiate*, etc., (1819;) I cite 3me Édit., Paris, 1831, T. II, p. 6 *et seq.*—according to whom the semitransparent miliary granulations of BAYLE are simply the first stage of the tubercles which become converted into the yellowish "crude tubercles" by a process of change that begins in their centres. For his description of tubercular ulceration of the intestine see p. 38 *et seq.* ANDRAL—*Clinique Médicale*, (1824:) I cite 3me Éd., Paris, 1834. T. IV, p. 391 *et seq.* LOUIS—*Rech. Anat., etc., sur la phthisie.* (1825:) I cite 2me Éd., Paris, 1843, p. 84 *et seq.* He describes the tubercular intestinal ulcers as round when small, elliptical when larger. The elliptical ulcers are most frequent; next in frequency comes the annular form, (p. 89.) In the small intestine both the latter and the elliptical ulcers have their long diameter parallel to the direction of the valvulæ conniventes, (p. 94.) JOHANN WAGNER—*Die tuberculösen Darmgeschwüre*, Oesterreich. Med. Jahrb., N. F., Bd. I, 1829, Heft 2, S. 82. A noteworthy essay, in which the appearances of tubercular ulcers that have commenced to heal are described, although the author admits that he has never seen an example of complete cicatrization, p. 93. C. ROKITANSKY—*Ueber Stricturen des Darmkanals*, etc., same Journal, Bd. XVIII. 1839, S. 30 *et seq.*—relates two cases of intestinal stricture resulting from the partial cicatrization of tubercular ulcers. For the classical description of intestinal tubercle by this author, see the several editions of his text-book on Pathological Anatomy, cited p. 438, *supra*. AUG. FOERSTER—*Handb. der spec. path. Anat.*, Leipsic, 1854, S. 61; also 7te Aufl., Jena, 1864, S. 227. H. LEBERT—*Traité d'Anat. Path.*, T. I, Paris, 1857, p. 681. E. KLEBS—*Handb. der path. Anat.*, Bd. I, Abth. 1, Berlin, 1869, S. 256. E. WAGNER—*Das Lymphadenom des Darmcanals;* in *Das tuberkelähnliche Lymphadenom.*, Archiv der Heilk., Jahrg. XII. 1871, S. 6. E. RINDFLEISCH—*Lehrb. der Path. Gewebelehre*, 3te Aufl., Leipsic, 1873, S. 329; also Amer. Transl., Philada., 1872, p. 355. THEODOR HERING—*Stud. über die Tuberkulose*, Berlin, 1873, S. 72, Tuberkulose des Darmkanals.

And first I would point out that, even in ordinary lung phthisis in civil life, every obstinate diarrhœa that occurs during the course of the disease is not to be regarded as due to tubercles of the intestine. On the one hand, it is now very generally acknowledged that all cases of lung phthisis are not tubercular; we have learned to recognize, and clinically at least, forms of phthisis arising from various chronic inflammatory processes in the lungs, which, although often associated with the formation of tubercles, may occur quite independently of them.* In such cases simple intestinal catarrh accompanied by diarrhœa often originates during the advanced stages of the disease.† But intestinal catarrhs of the very same character may also arise during the progress of unmistakable cases of tubercular lung phthisis, and probably in many instances precede the formation of the intestinal tubercles. On the other hand, it is well established that marked tubercular disease of the intestine, and even characteristic tubercular ulceration, may be found after death in cases in which no diarrhœa existed during life.‡ These facts would seem to indicate that the cause of the diarrhœa which occurs during phthisis is to be sought rather in the coexisting intestinal catarrh than in the tubercular disease *per se*.

During the civil war individuals in whom tubercular disease of the lungs, or some one of the various forms of lung phthisis, had actually commenced, were found in great numbers in the military service of the United States. The predisposition to phthisis is so common in this country both among natives and European emigrants, and the exposures of army life in our climate are so favorable to the development of this disease in the predisposed, that in spite of the comparatively severe and careful medical examination of recruits for the regular army, phthisis was always a notable cause of death and discharge for disability among our troops. But after the civil war began the medical examination of recruits was notoriously insufficient and often entirely neglected, so that those predisposed to phthisis or actually suffering with the early stages of this disease found their way into the ranks almost without restraint. Moreover, the unusual exposures and hardships of active campaigning, the exhaustion of fatigue, the nutritive disturbances resulting from insufficient and badly cooked food, and the various inflammatory affections of the respiratory organs produced by exposure to the inclemency of the weather, served as so many exciting causes to determine the development of phthisis among the predisposed, and undoubtedly produced it in many who were apparently healthy when enlisted.

These phthisical patients were exposed simultaneously with their fellow soldiers to all the causes that produce diarrhœa and dysentery; and so far from being protected by any such antagonism between dysentery and tuberculosis as Rokitansky§ supposed to exist, these feeble individuals seemed to possess even less resisting power than their comrades with healthy lungs. Accordingly we have already seen‖ that tubercular disease of the lungs was noted in nearly one-sixth of all the autopsies of fatal cases of the forms of

* On this subject the reader may consult NIEMEYER—*Lehrb. der spec. Path. u. Ther.*, 7te Aufl., Berlin, 1868, Bd. I, Abschnitt 3, Cap. XI u. XIII, S. 220 u. 234, on chronic interstitial pneumonia and pulmonary consumption; BUHL—*Lungenentzündung, Tuberkulose und Schwindsucht*, 2te Aufl., 1873, or Amer. Transl., New York, 1874; JUERGENSEN—Articles on *Croupous and Catarrhal Pneumonia*, in Ziemssen's Cyclopædia, Amer. Ed., Vol. V, New York, 1875, pp. 49 and 199; and RIEGEL—Article on *Croupous Bronchitis*, same work, Vol. IV, New York, 1876, p. 449. Any one who will compare these works, even without going further, will be struck with the great differences of opinion which exist on these subjects; differences which it is impossible to discuss in this place. For agreeable summaries of some of the conflicting views as to the relation of tubercles to these inflammatory processes, see A. W. FOOT—*Tuberculosis*, The Dublin Jour. of Med. Sci., July, 1877, p. 1, and Aug., 1877, p. 101; and D. J. HAMILTON—*On [illegible] in the human lung*—Edinburgh Med. Jour., Oct., 1877, p. 289.

† In such cases also, according to COLBERG—S. 481, *op. cit.*, note; to p. 335, *supra*—amyloid ulcers of the intestine are frequently [illegible].

‡ See, for example, RUEHLE—*Pulmonary Consumption*, in Ziemssen's Cycl., Vol. V, New York, 1875, p. 575. "On the other hand, perforating lesions of considerable extent are sometimes found in the intestine, without there having been any diarrhœa during life. Solid, globular, normally colored fæces may often be found in these cases within the cæcum adherent to the ulcerating surface."

§ See p. 535, *supra*. ‖ *Supra*, p. 535.

flux heretofore described. The fact that this complication was more commonly noted in the chronic cases would seem to render it probable that a protracted intestinal flux favors the development of lung phthisis in the predisposed; but even in many of these chronic cases the lung trouble was undoubtedly the older affection of the two, and this was probably also the relation of the two diseases in the majority of the fatal cases of acute diarrhœa and dysentery in which lung phthisis was found after death. In the larger number of the cases referred to, notwithstanding the lung complication, the intestinal lesions offered no peculiarities. Dissection disclosed simple catarrhal inflammation of the intestinal mucous membrane, with or without thickening of the submucosa and follicular ulceration in the chronic cases; or acute diphtheritic dysentery, which in the chronic cases was recognizable by the great unhealed ulcers resulting from the separation of the diphtheritic sloughs. But besides such conditions, which have already been sufficiently considered, there was another group of cases, differing from the former in no noteworthy particulars during life, while after death tubercular ulcers of the intestine were found, variously combined with the lesions characteristic of the other forms of flux.

Even in the less complicated cases that occur in civil practice there are no positive symptoms by which it can be determined during life whether the diarrhœa of the later stages of phthisis is the result of a simple catarrhal process or is accompanied by tubercular disease of the intestine. It has been shown that in the latter class of cases, consumption of the bowels as they are often called, the diarrhœa is obstinate; is prone to recur if temporarily checked; that the stools are not excessively frequent, varying usually from two to six daily; that they are often painless; that they frequently contain admixtures of mucus, blood and pus, and are often deficient in biliary coloring matter;* but all these phenomena belong to ordinary cases of chronic intestinal catarrh and offer nothing peculiar. The meteorism, abdominal tenderness, ascites and other symptoms that appear after tubercular peritonitis has set in differ in nothing from those which accompany the non-tubercular peritonitis sometimes developed in chronic ulcerative catarrhs. If the practitioner, observing these symptoms during the advanced stages of phthisis, should be led by that circumstance to express the opinion that tubercular disease of the intestines exists, his conjecture will undoubtedly sometimes be verified; but even in civil practice it will also be frequently contradicted by the appearances found on dissection,† and this will still oftener be the case in the military service, because the development of non-tubercular intestinal inflammation is favored by so many circumstances.

The cases of flux, that were observed during the civil war, associated with tubercular ulcers of the intestine presented, then, no characteristic symptoms by which, in the present state of our knowledge, their nature could have been determined during the life of the patient. The symptoms were in part those belonging to the chest affection, in part those of a chronic intestinal catarrh. As in other intestinal catarrhs, acute diphtheritic dysentery sometimes supervened during their progress, and was then apt to prove speedily fatal. This complication appears in one instance, case 200, to have occasioned the diagnosis

* Compare BAMBERGER—*Die Tuberculose des Darmkanals*, in Virchow's Handb. der spec. Path. u. Ther., Bd. VI, Abth. 1, Erlangen, 1855, S. 451; NIEMEYER—*op. cit.*, p. 577, *supra*, Bd. I, S. 658; and RUEHLE—*loc. cit.*, last note.

† Even NIEMEYER—*loc. cit.*—who declares that we should suspect tubercular ulcers whenever diarrhœa occurs during decided tuberculosis of the lungs, admits that in these cases the diagnosis is not certain, and goes so far as to say that the colliquative diarrhœa of consumption may occur without our being able to find any evident structural changes of the intestine on autopsy. I may add that the assertion of G. ABAZA—*Inaug. Diss. über die Darmtuberkulose*, Berlin, 1870, S. 16—that in these cases necrosed shreds of mucous membrane (nekrotisirte Fetzen von der zerstörten Darmschleimhaut) can be recognized, though only scantily, in the stools, is probably the expression rather of a scholastic anticipation than of actual observation; for if such fragments were found in any case, the fact would merely indicate the existence of sloughing ulcers without showing their nature.

typhoid fever to be recorded on the register of the hospital in which the patient died.* Tubercles of the peritonæum and tubercular peritonitis complicated most of the cases; but were not often severe enough to give rise to symptoms. Perforation of the intestine and intestinal stricture resulting from partial cicatrization of the ulcers—rare accidents which have been noted by European pathologists in this form of intestinal disease—were not observed in any of the cases collected during the civil war.

To dwell further on the symptoms observed in this group of cases would merely lead to needless repetition of what has been said in previous parts of this Section, and I pass, therefore, at once to an account of the anatomical conditions actually observed.

Post mortem appearances in tubercular ulceration of the intestines.—According to most authors, intestinal tubercles first make their appearance as enlargements of the solitary and agminated follicles, which offer to the naked eye no peculiarities in size, form or general appearance, by which they can be distinguished from follicles enlarged in consequence of ordinary intestinal catarrh; so that doubtless mere catarrhal enlargement of the follicles has often been mistaken for tubercular disease. Central cheesy metamorphosis speedily attacks the follicles affected by the tubercular process. The result, in the case of the solitary follicles, is the production of a small cup-shaped or crater-formed ulcer varying from the size of a millet-seed to that of a split-pea, the so-called primary tubercular ulcer of Rokitansky.† By a continual formation, cheesy metamorphosis and breaking down of new tubercles in the margins of such ulcers, they may ultimately attain considerable size. Meanwhile the surrounding mucous membrane is generally the seat of a more or less intense catarrhal inflammation, differing in nothing from the ordinary forms of inflammation of the intestinal mucous membrane already described. The most striking results of this complication in the small intestine are a club-shaped or polyp-like hypertrophy of the villi, giving the mucous surface of the affected area a plush-like appearance, and frequently excessive thickening of the edges of the ulcer, which, however, is only partly inflammatory, being partly also due to tubercle-formation. Various forms and stages of these tubercular ulcers of the solitary follicles are shown in preparations Nos. 551, 771 and 798, Medical Section, Army Medical Museum.

A similar central caseous transformation, giving rise to the production of crater-like ulcers, occurs also in the swollen follicles when tubercular disease affects the patches of Peyer. In this case a characteristic feature is generally to be observed from the very first: whereas in ordinary intestinal catarrh, as well as in the peculiar follicular disease of typhoid fever, all the individual follicles of the affected Peyer's patch are pretty uniformly involved; in tubercular disease, on the contrary, a single follicle, or a small number only of the follicles of any given patch, are often found to have undergone considerable enlargement and to have submitted to central caseous transformation or even to ulceration, while the remaining follicles of the patch are but slightly or moderately affected. By the subsequent progress of the ulcerative process the whole of the affected Peyer's patch is indeed often destroyed; but here, again, a remarkable circumstance often happens: The ulcer spreads

* See p. 404, *supra*. In case 200 the patient was admitted to the hospital in which he died but two days before death. He had [illegible] and 30 to 40 stools a day, which were passed involuntarily during sleep. Besides general catarrhal inflammation of the intestinal [illegible] and transverse or oval tubercular ulcers of the small intestine, incipient diphtheritic deposits were observed in the sigmoid flexure; it was [illegible] minute granules of lymph, which firmly adhered to the congested mucous surface." In case 341 the diagnosis of typhoid fever was also recorded on the hospital register, but in this instance apparently without justification by the symptoms.

† Rokitansky—*Lehrb. der Path. Anat.*, 3te Aufl., Bd. III. Vienna 1861, S. 225.

laterally far beyond the original limits of the affected patch, while at the same time a longitudinal contraction occurs by which its width is greatly diminished and the surrounding mucous membrane thrown into characteristic transverse folds. Like those which arise in the solitary follicles, these ulcers usually have greatly thickened worm-eaten edges, and the surrounding mucous membrane is generally in a state of catarrhal inflammation, a notable feature of which is the polyp-like hypertrophy of the villi already mentioned. Specimens Nos. 674 and 798, Medical Section, Army Medical Museum, illustrate the early stages of tubercular ulcers in Peyer's patches.

The subsequent extension of such tubercular ulcers takes place, as in the case of those seated in the solitary follicles, by the continual formation, cheesy transformation and breaking down of new tubercles in the margins of the ulcers. The enlargement, however, does not take place indifferently in all directions, but usually much more rapidly in a line transverse to the axis of the intestine, and parallel in the small intestines to the valvulæ conniventes. In some few cases this rule is violated, and the form assumed by the ulcer as it spreads is determined by the outline of the affected Peyer's patch, the whole of which is destroyed before the adjacent mucous membrane is invaded. No. 808, Medical Section, is an illustration of this condition. But in the great majority of cases the ulcers spread in the transverse direction, assuming at first an elliptic form, which gradually becomes more and more elongated until ultimately it almost encircles the intestine, a condition which has been described as the annular ulcer or girdle-sore.

This ultimate development into a girdle-sore is quite significant of tubercular ulceration. The only other conditions that give rise to it are embolism of an intestinal vessel* and amyloid ulceration. The first is readily distinguished by the presence of the embolus in the artery leading to the affected part and by the necrotic character of the process in the portion of mucous membrane involved. The second has less prominent edges, and the larger ulcers are prone, especially in the small intestine, to be much wider than is usual in tubercular ulceration.† Moreover, tubercular ulceration can usually be quite positively distinguished from these two forms by the circumstance next to be considered. Successive crops of new tubercles are continually forming in the edges and at the base of the tubercular

* The embolic ulcer results from the plugging of a larger or smaller branch of the mesenteric artery by an embolus. It occurs, therefore, especially to patients in whom the conditions for embolism exist; *e. g.*, those suffering from valvular disease of the heart, atheroma of the aorta, etc. The part of the intestinal mucous membrane whose nutrition is thus cut off falls into a condition of necrosis, which may be preceded by hæmorrhagic infarction or even by diphtheritic exudation. If the territory involved is not too extensive, the ulcer left after the separation of the slough may heal, and in so doing give rise to intestinal stenosis. This process may be recognized by its form, which always corresponds to one or more vascular territories, but especially by the discovery of the embolus in the arterial twig supplying the affected part. The process cannot be diagnosticated during life. See, on this subject, BIESIADECKI—*Ueber die durch Embolie hervorgerufenen Veränderungen im Darme*, in report of a meeting of the Vereio der Aerzte Niederösterreichs, Allg. Wien. med. Zeitung, Jahrg. XX, 1875, S. 468, and STANISLAUS PARENSKI—*Ueber embolische Darmgeschwüre*, Stricker's med. Jahrb., 1876, S. 275.

† N. FRIEDREICH—*Ueber Amyloiddegeneration*, Verh. d. naturhist.-med. Ver. zu Heidelberg, 1858, Bd. V, S. 144; I cite the abstract in Schmidt's Jahrb., Bd. 103, 1859, S. 7. B. AUFRECHT—*Amyloid-Geschwüre des Darmkanals*, Berliner Klin. Wochenschrift, Jahrg. VI, 1869, S. 315—speaks in connection with the case which serves as the basis of his description of the ulcers as involving considerable territories of the intestine, ("die sich über so lange Strecken des Darmes hinziehen, und überall die ganze Circumferenz desselben einnehmen," &c.) See also the paper of HAYEM, cited note † to page 334, *supra*, and COLBERG, cited note ‡, page 335, *supra*. A part of the ulcers described by the latter author appear to me to have been really tubercular. Compare, also, on the general subject of annular intestinal ulcers, E. LEUDET—*Clinique Méd. de l'Hôtel-Dieu de Rouen*, Paris, 1874, Art. VII, p. 222: "Des ulcérations annulaires et des rétrécissements cicatriciels de l'intestin grêle." In a general way the annular ulcer of the intestine can result only from processes confined to a number of vascular territories. The form of the vascular territory involved in the process determines the form of the embolic, amyloid and tubercular ulcers. Some similar reason must explain the annular ulcers said by LEUDET and others—*op. cit.*, p. 255 *et seq.*—to occur in constitutional syphilis from the breaking down of syphilitic gummata, if indeed these were really other than amyloid ulcers. DICKINSON—*Cases of perforation of the sigmoid flexure of the colon probably due to the irritation of fæces*, Trans. of the Path. Soc. of London, Vol. XVIII, 1866-7, p. 101—has described a form of transverse or annular ulceration occurring in cases of fæcal obstruction, in which the annular shape appears to be due to the fact that the ulcers form "upon the prominent transverse folds of the bowel, by reason of which they are parallel to each other, and across the axis of the intestine." These appear to result from the direct local irritation of the decomposing fæcal matter, and the parts most prominently exposed are first attacked. There may be yet other rare varieties of annular ulcer, but the sweeping assertion that "all long-standing ulcerations in the bowel" may acquire an annular shape similar to that which occurs in the tubercular variety (WILKS and MOXON, *Lectures on Path. Anat.*, 2d Ed., London, 1875, p. 414) is certainly not in accordance with my own experience. Of the large number of specimens of "long standing ulcerations" collected at the Army Medical Museum, none but the tubercular cases are distinctly annular.

ulcer as well as in the lymphatic sheaths of the arterioles and other lymphatic passages leading from its vicinity. These tubercles arise as the so-called gray granulations, undergo central cheesy metamorphosis, the cheesy portion liquefies and is discharged.* This process is a constant and important factor in the extension of the ulcer, the base and edges of which have in consequence a characteristic worm eaten appearance.

The as yet unsoftened tubercles can be recognized by the naked eye, or still better by a simple lens, in the vicinity of the tubercular ulcer, whether in the uncut preparations or in sections, and constitute the most characteristic feature in determining the nature of the process. Simultaneously, a crop of miliary tubercles often arises in the subperitoneal connective tissue, which in some cases are irregularly scattered over a limited area, corresponding in size and position to the ulcer on the mucous surface of the piece, while in others they radiate thence towards the mesentery in lines which follow the course of the lymphatic passages. A local peritonitis, corresponding to the area of subperitoneal tubercular deposit, now sometimes glues the adjacent knuckles of intestine together, or a general peritonitis may be set up, but in other cases peritoneal inflammation is very slight or even entirely absent. To illustrate the appearances most frequently presented by characteristic tubercular ulcers of moderate size, I have selected a case observed in Satterlee hospital, West Philadelphia, during the summer of 1862:

CASE 905.—Private Alonzo York, company K, 3d Vermont volunteers, age 23, was enlisted July 16, 1861, and appears on the muster rolls of his company as present for duty from that time to June 30, 1862. According to the regimental hospital records he reported sick July 23, 1862, and was excused from drill; was admitted to regimental hospital for treatment July 26th; diagnosis, remittent fever; and was sent to general hospital August 7th. The register of Satterlee hospital, West Philadelphia, shows him admitted August 10th: Rheumatism. Died September 15th. The following account of the autopsy was furnished by Acting Assistant Surgeon J. Leidy, according to whose report this man was treated in Satterlee hospital for phthisis, rheumatism and chronic diarrhœa *Autopsy*, three hours after death: The body was much emaciated and the skin about the pit of the stomach was in an ecchymosed condition. The right lung was bound to the thoracic parietes by old pleuritic adhesions. A tuberculous deposit occupied its apex, and elsewhere it contained a number of tuberculous masses from the size of a cherry-stone to that of a peach-stone, some of them softened in their centres. The left lung was bound to the thoracic parietes posteriorly by old adhesions and contained about twenty tuberculous masses from the size of a cherry-stone to that of a shellbark. The heart was pale, devoid of fat, otherwise normal, and contained no clots. The liver was of a dull-brown color; the spleen healthy, on section lake-red; the mesenteric glands much enlarged by tuberculous deposits. The stomach was moderately contracted; its mucous membrane presented a few slightly injected patches. The intestines were also contracted. On being opened the mucous membrane of the entire intestinal tract was found to be inflamed from the duodenum to the anus. In the ileum the agminated glands were all destroyed by ulceration; the ulcers had thick, hardened edges, and their long diameters were transverse to the axis of the intestine. Similar ulcers, but of smaller size, existed high up in the jejunum; it was impossible to say whether all of these had originated in agminated glands, for no trace of these latter structures remained. Patches of opaque white tubercles about a line in diameter were situated on the peritonæum beneath the position of every ulcer; quite circumscribed peritonitis accompanied these patches. The inflammation of the mucous membrane of the colon was most acute at its two extremities; it was associated with blackened solitary follicles, desquamated epithelium and patches of pseudomembrane; there were also a number of ulcers where the pseudomembrane had separated. The kidneys were healthy. The cortical substance of the suprarenal bodies was of a dull brownish-yellow color, but did not appear to be altered in structure.

Nos. 244 to 261, Medical Section, Army Medical Museum, are from this case. The first six or seven pieces are successive portions taken from the jejunum; the rest, with the exception of No. 261, which is a piece of the colon, are successive portions selected from the ileum. The pieces of small intestine show altogether twenty-nine tubercular ulcers, and a number of similar ones existed in the intermediate portions which have not been preserved. These ulcers range from less than half an inch to about two inches in long diameter measured transversely to the axis of the bowel. They have irregular thickened edges, and by the naked eye discrete tubercles, some gray, some caseous, can be recognized

* In view of this characteristic process, I find myself quite unable to agree with CHARCOT when he declares that it is not yet demonstrated that it is possible to distinguish between tubercular ulcers and those of typhoid fever.—Bull. de la Soc. Anat. de Paris, an 49, 1874, p. 743. Even with the unaided eye, the process described in the text can generally be recognized.

in their bases and margins. A few of the smallest ulcers have no tubercles on their peritoneal surface, but most of them exhibit peritoneal tubercles as well as shreds of adhesions resulting from the circumscribed peritonitis described by Dr. Leidy in his account of the case. The intestinal walls are quite thin and semitransparent, which would be favorable for observing the agminated glands of Peyer, if any trace of them were left. They appear, however, to have been entirely destroyed by the ulcerative process, and the circumstance that notwithstanding this fact the widest of the ulcers do not greatly exceed half an inch in transverse diameter, as measured with the length of the intestine, is probably to be accounted for by a longitudinal contraction of the ulcerated surface as manifested by the well marked transverse puckering of the mucous surface in the vicinity of the ulcers.

The plate facing this page is reproduced from a photograph representing No. 257, Medical Section, which is one of the pieces of ileum from this case.* In consequence of the coexisting catarrhal inflammation, the existence of which is mentioned by Dr. Leidy, the villi were somewhat hypertrophied, giving the general mucous surface a velvety appearance. A little below the middle of the piece there is an elliptical ulcer about an inch and a half in long diameter and half an inch wide. The edges of this ulcer are quite thick, and in places have the characteristic worm-eaten appearance resulting from the necrotic destruction of individual tubercles. In the base of the ulcer the same process has produced several little cavities big enough to receive a pin's head, which can be well seen in the plate, especially by the aid of a lens. Both gray and caseous tubercles, the size of a pin's head or smaller, can also be distinguished by the naked eye in the edges and bottom of the ulcer in the specimen, but the differences of color being lost, they cannot be positively identified in the plate, though traces of them can be seen. The mucous membrane in the vicinity of the ulcer is thrown into well marked transverse folds, in consequence of the contraction in the direction of the length of the intestine, already described.

The plate facing page 584 is reproduced from a photograph of the peritoneal surface of the same specimen. It exhibits, in a space corresponding to the area of the ulcer and

* I find the following representations of tubercular disease of the intestines in the iconographic works: RICHARD BRIGHT—*Reports of Medical Cases*, London, 1827, Plate XI, "Ulceration of the colon and small intestines in phthisis pulmonalis;" Plate XII, "Ulceration of the cæcum, colon and ileum in phthisis pulmonalis;" five colored figures, (engraved on copper,) which, however, leave much to be desired in regard to the representation of textural details. *Anat. Drawings from Preparations in the Museum of the Army Med. Dept. at Chatham*, London, 1824, Fasc. I, Plate IX, Figs. 5 and 6: Fig. 5 shows a transversely elliptical tubercular ulcer; Fig. 6, "The external surface of the same, exhibiting the lacteals arising from the ulcer in a varicose state;" Fasc. 2, Plate VII, Fig. 4, "displays several ulcers in the interior of the ileum, produced by the maturation of tubercles." Although coarsely lithographed, these figures give a pretty good notion of some of the appearances of tubercular ulcers. J. HOPE—*Principles and Illustrations of Morbid Anatomy*, London, 1834—Figs. 152 and 161, colored lithographs. Fig. 152 is a coarsely executed but pretty effective representation of a girdle-sore of the small intestine; Fig. 161 represents scattered tubercular ulcers, (seated in the solitary follicles?) ROBERT CARSWELL—*Illustrations of the Elementary Forms of Disease*, London, 1838, Tubercle. Plate III, Fig. 1, a colored lithograph, representing a piece of ileum with a portion of mesentery and some mesenteric glands attached. The mucous surface of the ileum displays two much thickened, oval, Peyer's patches, whose long diameter is parallel to the axis of the intestine. On the surface of these patches a number of tubercles smaller than pins' heads are represented; a number of enlarged solitary follicles and several small ulcers are also seen on the surface of the piece. One end of the portion of ileum is turned over so as to show its peritoneal surface, on which the branches of two lacteals, "dilated and filled with tuberculous matter," ramify. A similar condition of the lacteals is represented in all parts of the mesentery shown. The mesenteric glands are enlarged, and some of them being laid open display tubercular or cheesy deposits in their interiors. This figure is in every way worthy of the reputation the plates of CARSWELL have deservedly acquired. A somewhat similar condition of the lymphatics had previously been represented by J. CRUVEILHIER—*Anat. Path.*, T. I, Paris, 1829-35, Livr. 2, Plate I, in which a loop of intestine is figured with groups of tubercles on its peritoneal surface; the lacteals dilated, though to a much less degree than in the figure of CARSWELL, are described as filled with tubercular matter—"matière tuberculeuse dans les vaisseaux lactés." GLUGE—*Atlas der Path. Anat.*, Bd. II, Jena, 1850, Die Skrophulose und die Tuberkulose, 15te Lief.—Taf. I, Fig. 3, is a coarse lithograph representing tubercular ulceration of the small intestine; not very satisfactory. Taf. V, Fig. 1, is an uncolored copy of CARSWELL'S figure, described above; and Fig. 16 a magnified view (very unsatisfactory) of a small tubercular ulcer of the small intestine. ALBERS—*Atlas der path. Anat.*, Abth. IV, Bonn, 1862, Taf. XX, Figs. 1–10—devotes a plate containing ten lithographic figures, all but one colored, to tubercular ulcers of the intestine. I cannot speak with praise either of the selection of the pieces or the skill with which they are represented. H. LEBERT—*Traité d'Anat. Path.*, Atlas, T. II, Paris, 1861, Plate CXXII, Figs. 3, 4 and 5—gives three neatly executed figures, (copperplate,) one of them colored, representing tubercular ulcers of the small intestine, in two of which the ulcers have perforated. A. THIERFELDER—*Atlas der Path. Histologie*, Lief. 2, Leipsic, 1873, Taf. XIII, Fig. 1—has given an admirable lithograph of a perpendicular section through a tubercular ulcer of the small intestine as seen with a power of 35 [25?] diameters. I bestow upon this representation the well deserved praise, that it is not merely in all essential features, so far as it goes, nature-true, but that it is the only conscientious attempt to represent a perpendicular section through such an ulcer with which I am acquainted, for of course the little diagrammatic wood cut given by KLEBS—Fig. 7, S. 258, *op. cit.*, note ‖, p. 576, *supra*—can hardly be regarded as more than a diagram.

*Heliotype.* *James R. Osgood & Co., Boston.*

TUBERCULAR ULCER OF ILEUM.

FRONT VIEW.

No. 257. MEDICAL SECTION.

its immediate vicinity, about fifty tubercles, the largest of which, though not exceeding a pin's head in size, have already undergone central or complete caseous degeneration. Slight peritoneal adhesions, produced by local peritonitis, appear as delicate shreds attached to the peritoneal surface between the tubercles. This case is in several respects a striking one. It appears from the record that the patient, notwithstanding his lung disease, did duty as a soldier until nine weeks before his death. He accompanied the army of the Potomac in its disastrous peninsular campaign, and when first taken on sick report at Harrison's Landing, his symptoms were such as to suggest the diagnosis remittent fever to the regimental surgeon. At some time during the progress of the case diphtheritic dysentery supervened, for the colon did not exhibit the characteristics of tubercular ulceration, but was plastered with pseudomembrane. The ulcers mentioned in Dr. Leidy's account of the autopsy were in part small follicular ulcers, the result of the intestinal catarrah, in part superficial erosions produced by the separation of portions of the diphtheritic slough. These conditions are well displayed in No. 261, Medical Section, which is a portion of the colon from this case. Just when the diphtheritic process set in is not shown by the history of the case; I suspect from the specimen that it was not long before the fatal issue. In any event this series of specimens shows in a striking manner the coexistence in the same individual of exquisitely developed tubercular ulceration of the small intestine, with a diphtheritic dysentery supervening upon a chronic catarrh, resembling in all respects the cases so common during the war in non-tubercular patients.

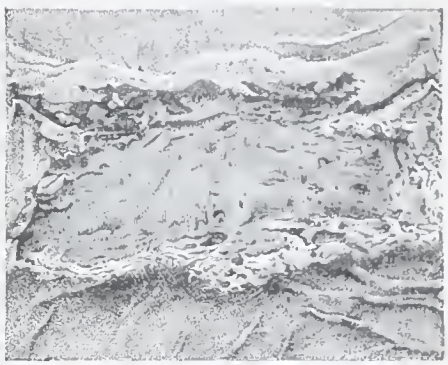

FIG. 33.—Tubercular girdle-sore, natural size. From a photograph of No. 420, Medical Section, Army Medical Museum. (Case 413.) See p. 584.

The series of specimens preserved from case 413* illustrate somewhat different and, if possible, still better marked conditions. In this case there was a history of chronic lung trouble of several years' duration. There is not only no history of diarrhœa, but it is distinctly stated, by the attending medical officer, three days before the death of the patient, that "his bowels are regular." Yet on the autopsy, besides tubercular disease of the lungs and ulceration of the larynx, extensive tubercular ulceration was found in the small intestine, cæcum and vermiform appendix. The ulcers in the small intestine were quite numerous, and for the most part appeared as fully developed girdle-sores enveloping the whole, or almost the whole, circumference of the bowel. In long diameter, they measured transversely to the axis of the bowel an inch and a half or two inches; in breadth, measured parallel to the axis of the bowel, from half an inch to an inch. The characteristic deposit of tubercles and the tiny excavations resulting from their necrosis could be observed in the bases and thickened edges of all these girdle-sores. A conspicuous deposit of tubercle was observed in the peritonæum opposite all of them; it was, however, by no means limited to territories corresponding to the site of the ulcers, but extended in the neighborhood of many of them over irregular areas of several times greater size. These peritoneal tubercles occurred not merely as discrete nodules of pin-head size or smaller, gray, or in various stages of cheesy metamorphosis, but also as irregular yellowish flattened patches, resulting apparently from the caseous metamorphosis and coalescence of a number of closely situated nodules. Besides the girdle-sores, there were

* Page 181, *supra*.

also a number of small ulcers, some situated in the solitary follicles, others in some of the patches of Peyer, other parts of which were but slightly diseased.

Several specimens selected from the intestine of this subject have been preserved in the Medical Section of the Museum.* No. 428 is from the upper portion of the jejunum, and exhibits a very large and very characteristic girdle-sore. No. 429, from the upper portion of the ileum, exhibits two such ulcers. One of these is represented on the previous page by Fig. 33, which gives a just idea of the thickened worm-eaten edges, and the little cavities left by the necrosis of individual tubercles. There was an abundant crop of tubercles on the opposite peritoneal surface, which, however, corresponded rather to the edges of the ulcer, and their vicinity beyond the ulcer, than to the base of the ulcer itself. It is worthy of note that each of the girdle-sores in this case appears to have destroyed the whole of the Peyer's patch in which it was situated, and that the well marked transverse puckering of the adjacent mucous membrane indicates that the process of longitudinal contraction already commented upon had taken place to a marked degree. In striking contradistinction to this is the condition of some of the other Peyer's patches. One of these, in No. 430, Medical Section, is shown in Fig. 34. It is of the usual elliptical shape, and for the most part very slightly thickened, yet displays scattered over its surface no less than twenty-one separate small ulcers, which from their characters I am compelled to regard as tubercular. There are besides, in this specimen, several small ulcers of similar character which I suppose to have originated in the solitary follicles. No. 431 is a portion of the cæcum and the vermiform appendix from the same case. In the cæcum there are four tubercular ulcers, the largest of which is represented in Fig. 35. It is about an inch and a half long and half an inch wide; its long diameter disposed transversely to the axis of the bowel. The figure gives a very good notion of the appearances of a tubercular ulcer of the large intestine. Almost the whole of the mucous surface of the vermiform appendix, as shown in this specimen, was destroyed by a tubercular ulcer, in the base of which tubercles and tiny cavities resulting from their necrosis can be distinctly seen. The rest of the colon in this case presented no marked inflammatory conditions, a circumstance which undoubtedly accounts for the absence of diarrhœa during the progress of the disease.

FIG. 34.—A number of small tubercular ulcers in a very slightly thickened Peyer's patch, natural size. From a photograph of No. 430, Medical Section, Army Med. Museum.

FIG. 35.—Tubercular ulcer of the cæcum, natural size. From a photograph of No. 431, Medical Section, Army Medical Museum.

Case 434† may also be mentioned here as one in which, besides tubercular ulcers of the small intestine, in many respects resembling those found in case 413, marked tubercular ulceration of the large intestine existed. No. 485, Medical Section, is the lower extremity of the ileum, with the ileo-cæcal valve and a part of the cæcum of this subject; there is a transverse ulcer just above the valve; the cæcum is thickened and the whole surface of the part preserved ulcerated. No. 486 is a small part of the cæcum and the vermiform appendix laid open. The mucous surface of this part of the cæcum also is destroyed by ulceration, while that of the vermiform appendix presents altogether

* Besides which, No. 426, Medical Section, is the larynx; 427 a portion of the upper lobe of the left lung; and 432 a mass of the enlarged mesenteric glands. See the brief description on page 181.

† Page 186, *supra*.

*Heliotype.* *James R Osgood & Co, Boston.*

TUBERCULAR ULCER OF ILEUM.

PERITONEAL SURFACE.

No. 257. MEDICAL SECTION.

about a dozen ulcers, most of them of moderate size, elliptical, their long diameters transverse to the lumen of the appendix; but one of them, which occupies the whole central third of the appendix, is much larger and apparently formed by the coalescence of several ulcers similar to the others. No. 487 is a portion of the transverse colon of the same subject; it exhibits two oval ulcers, each about three-quarters of an inch in long diameter, which have nearly coalesced, and which, had their union been completed, would have occupied about two-thirds of the circumference of the bowel. There are, besides, a number of smaller ulcers, the least of which offer excellent illustrations of the appearances presented by tubercular ulcerations of the large intestine in their early stages. The tubercular character of all these ulcers is shown by the presence in their bases and edges of numerous tubercles, and of the little cavities left by their necrosis. These characteristic features are especially notable in the large ulcerated surface in the cæcum. In this case the patient, besides the chest symptoms resulting from his lung disease, had suffered from a distressing diarrhœa for some time before death.

To the foregoing illustrations I add Fig. 36, which represents half a dozen crater-like tubercular ulcers of various sizes, as well as an ulcerated Peyer's patch three-fourths of an inch in long diameter, with thickened somewhat worm-eaten edges. The patient was a young mulatto woman who died in the Freedmen's hospital, Washington, D. C., March 3, 1866.* A great number of tubercular ulcers of solitary follicles were found in the ileum, and several of the patches of Peyer were thickened and ulcerated. These patches bore a superficial resemblance to the ulcers of typhoid fever, from which, however, they were distinguishable not only by crops of tubercles in the corresponding portions of the peritonæum, but by numerous tubercles in the bases and edges of the ulcers.

FIG. 36.—Tubercular ulcers of the ileum, natural size. From a photograph of No. 776, Medical Section, Army Medical Museum.

I note in all, including cases 413 and 434, twenty cases in Section II in which tubercular ulceration of the intestines appears clearly to have existed, viz: cases 98, 168, 413, 434, 524, 862, 863, 864, 865, 866 and 876, in all of which the diagnosis is confirmed by specimens preserved at the Army Medical Museum, and cases 236, 323, 341, 403, 455, 529, 530, 553, 592, which, from the record, appear pretty clearly to have been of a similar nature. Five of these cases, viz: 862, 863, 864, 865 and 866, were patients in the Freedmen's hospital, Washington, D. C.; two, 98 and 553, were colored soldiers; the remaining fourteen white soldiers. In all these cases tubercular disease of the lungs is stated to have existed, except case 553, in which the condition of the thoracic viscera is not recorded, and 592, in which they were not examined. There are, besides, nine cases, viz: 105, 199, 200, 349, 463, 608, 723, 740 and 748, which may possibly be examples of tubercular disease of the intestines, although from the imperfect character of the record, or other circumstances, all of them are open to more or less doubt.

It cannot, therefore, be said that the record indicates very great frequency for this form of flux; but on the other hand it may be remarked that the recognition of the lesions

* See *Catalogue of the Medical Section, Army Medical Museum*, Washington, 1867, p. 82, for particulars. The patient, a mulatto girl, age 18, admitted July 5, 1865, was jaundiced and anæmic. In August she had an intercurrent attack of acute pneumonia, followed by alternating constipation and diarrhœa, night sweats, extreme emaciation, and death March 3, 1866. On the autopsy both lungs were found to contain many tubercles, and there were large vomicæ in the left lung. The bronchial glands were enlarged and tubercular. The liver contained many miliary tubercles. There were also tubercles in the spleen, kidneys and mesenteric glands. Besides the ulcers of the small intestine described in the text, there were numerous tubercular ulcers in the colon.

in question requires a degree of training in pathological anatomy which many of the medical officers who made the autopsies reported in Section II did not possess; and I may especially suggest that I have classed as "undetermined"* some cases, in which it is merely recorded that the intestines were ulcerated and the lungs tubercular, that were very probably of this nature Nor shall I attempt in this place any detailed analysis of the other lesions observed in the cases just enumerated, but refer the reader interested on this head to the reports in Section III. I will merely remark that in most of them the mesenteric glands are said to have been enlarged, cheesy or tubercular, and that in a number of them the presence of tubercle was noted in other organs besides the lungs. In case 524 there was a perineal abscess, communicating with the rectum; and in case 876 anal fistulæ, which, being laid open, did not granulate. I may add that there are in the Army Medical Museum several other specimens of tubercular ulceration of the intestine from children, from women treated in the Freedmen's hospital, &c., which for obvious reasons are not described in this work.

Histological characters of the tubercular ulcers.—The contradictory views with regard to the minute structure of tubercle which have been advanced, especially during the last ten years, make this subject one of peculiar difficulties, and the time has not yet come in which it could be hoped that any attempt to reconcile the conflicting testimony with regard to many matters of detail can be entirely successful. No such attempt will be made here. I shall limit myself to a brief account of the appearances which I have been able to recognize in the specimens preserved in the Museum, with references to such of the modern works on the subject as have guided me in forming an opinion as to the nature of the changes observed.

When, then, perpendicular sections are cut through the edges of a tubercular ulcer of the small intestine, and the tissues adjacent, and examined with a power of ten or twenty diameters, the first circumstance that arrests attention is the occurrence of numerous tiny nodules which are found most abundantly in the immediate vicinity of the ulcer, but also, though in diminishing frequency, at a considerable distance from it, especially in the course of the arterial twigs, that supply the territory occupied by the ulcer, and of the lymphatics that issue from it. These occur either singly as exceedingly minute formations $\frac{1}{20}$ to $\frac{1}{100}$ of an inch in diameter or even smaller, or as compound nodules consisting of three or four to fifty or more of the smaller ones grouped together. The compound nodules are the smallest tubercles which can usually be distinguished by the unaided eye in unstained sections. The isolated ones, which may be designated the ultimate tubercle-granulations, are for the most part quite invisible without a lens unless the preparation is stained, when they are seen as colored points on account of the tinge acquired particularly by their peripheral portion. The central portion of those tubercle-granulations which lie nearest the edges of the ulcer is usually found converted by cheesy metamorphosis into granular debris, and often drops out from the thin sections during the process of preparation, leaving a tiny cavity. Similar cavities are formed when the ulcerative process invades the cheesy tubercle, and the little excavations left after the dropping out of the cheesy mass are often shown in the sections at the edges of the ulcer. .Between the tubercles the submucous connective tissue is in a state of chronic inflammation, with dilated bloodvessels, and infiltrated by a swarm of lymphoid elements which are most abundant just beneath the muscle

* Page 535, *supra*.

of Brücke and near the edges of the ulcer, as in the case of ordinary catarrhal ulcers. The mucosa also presents the usual phenomena of chronic inflammation; its adenoid tissue is infiltrated with lymphoid elements, by which the glands of Lieberkühn are pushed apart and its villi are hypertrophied, appearing as cylindrical or clavate forms often several times larger than their normal size.

A good idea of the general relations of these various processes in the neighborhood of a small crater-like tubercular ulcer is given by Fig. 37, which represents a section through such an ulcer from a portion of the ileum of case 413,* as seen with a magnifying power of fifteen diameters. The ulcer appears in the sections as a little cavity about $\frac{1}{8}$ of an inch across, communicating with the lumen of the intestine by an orifice $\frac{1}{20}$ of an inch in diameter. Fig. 38, on the next page, represents a perpendicular section, cut transversely through the edge of a tubercular girdle-sore of the ileum; magnified eighteen diameters.

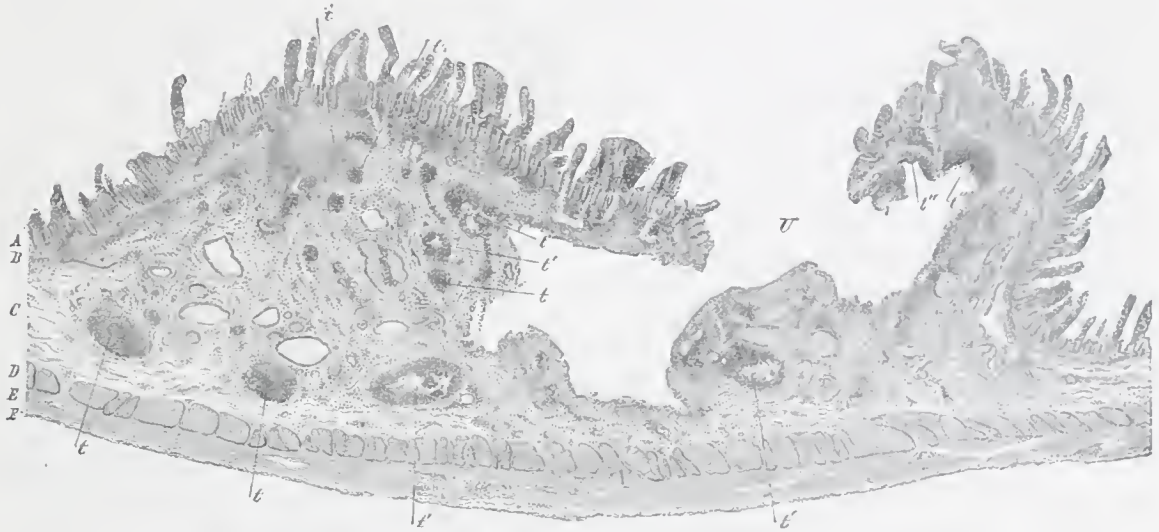


FIG. 37.—Perpendicular section through a small tubercular ulcer of the ileum. Magnified 15 diameters. From a photo-micrograph [Neg. 278, N. S.] of No. 7590, Microscopical Section, from case 413. A. The mucous membrane, with its tubular glands pushed apart by the accumulation of lymphoid elements; its villi greatly hypertrophied. B. The muscle of Brücke. C. Submucous connective tissue infiltrated with lymphoid elements, containing a number of tubercles in various stages; its bloodvessels diluted. D. Circular muscular coat of the intestine. E. Longitudinal muscular coat. F. Peritonæum. V. Cavity of the ulcer. *t, t, t, t, t.* Unsoftened tubercles. The two letters below the lower edge point to tubercles, in the centres of which peculiar oval forms are seen, (lymphatic vessels cut across? giant-cells?) the nature of which will be discussed further on. There are besides several unsoftened tubercles which are not lettered. *t', t', t', t'.* Tubercles with central softening in which part of the cheesy mass has fallen out. *t'', t''.* Softened tubercles whose cavities form part of the ulcer.

The patient was a colored man, who died of lung phthisis and tubercular ulceration of the intestine in the Freedmen's hospital, Washington, D. C., 1866. A brief account of the autopsy is appended in the foot note.† It is not recorded to what extent he suffered from diarrhœa, but the small intestine contained numerous tubercular ulcers both large and small. The large ones for the most part were elliptical with their long diameters transverse to the axis of the intestine, or formed actual girdle-sores. On the peritoneal surface, opposite the larger ulcers, a luxuriant crop of tubercle granulations could be seen, some of them isolated, others in groups of two to ten, twenty or more, forming compound tubercle-nodules. These were seated in the subperitoneal connective tissue, which was considerably thickened.

* See p. 583, *supra*.

† Joshua Jackson, colored, age 27; admitted September 23, 1866, in the last stages of consumption. Died October 8th. *Autopsy:* Lungs infiltrated with tubercle; a large cavity in the upper lobe of the left lung. The left pleural sac contained 8 ounces of fluid, and the left costal pleura was studded with tubercles. Near the anterior extremity of the left sixth rib, and connected with it, there was a yellow cheesy mass 2 inches in transverse diameter and an inch thick. Liver weighed 58 oz.; spleen, 5½ oz.; right kidney, 5½ oz.; left, 7 oz. The liver was amber-yellow and contained a few tubercles, as did also the spleen. The small intestine presented a number of tubercular ulcers, some apparently seated in Peyer's patches, others in the solitary follicles. The former were for the most part large, their long diameters transverse to the bowel, and had numerous tubercles seated beneath the peritonæum opposite them. The large intestine was not ulcerated and no inflammation was detected in its mucous membrane.

Other tubercles were found between the fasciculi of the muscular coat and in the submucous connective tissue beneath the ulcer and at its edges. [See Fig. 38.] Sections cut in like manner through tubercular ulcers of the large intestine present very similar appearances, except, of course, that there are no villi to be seen.

When, now, tubercles such as those shown in these sections are examined with a magnifying power of two to five hundred diameters it will be found that, besides the nodules whose central portions have dropped out from the sections, many others have undergone the cheesy metamorphosis. All degrees of this process will be found, from a mere dot of central change to the complete transformation of all parts of the nodule. The result is in every case the production of a granular detritus through which shrivelled nuclei are

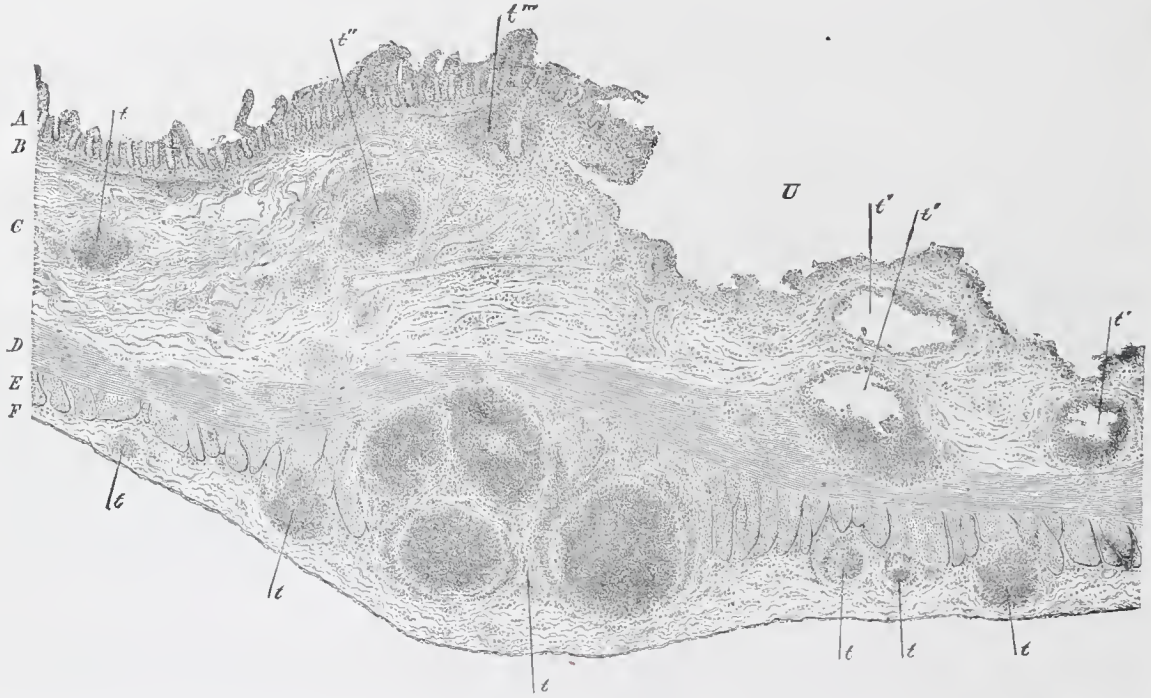


FIG. 38.—Perpendicular section cut transversely through the edge of a tubercular girdle-sore of the ileum. From a photo-micrograph [Neg. 978, N. S.] of No. 7519, Microscopical Section. A. Mucous membrane; its tubular glands pushed apart by an accumulation of lymphoid elements in the adenoid tissue; its villi hypertrophied, but most of them accidentally broken off in making the section. B. The muscle of Brücke. C. Submucous connective tissue, infiltrated with lymphoid elements, especially in the vicinity of the muscle of Brücke and near the edges of the ulcer; its bloodvessels dilated; it contains also a number of tubercles. D. Circular muscular coat of the intestine. E. Longitudinal muscular coat. F. Subperitoneal connective tissue, much thickened, and containing tubercles. *t, t, t, t, t, t.* Tubercles; there are also several not lettered; near the centre of the lower edge of the section five tubercles grouped together form a compound one. *t', t', t'.* Softened tubercles from whose interior the cheesy mass has dropped out in making the section. *t''.* A tubercle containing one of the peculiar bodies alluded to in the description of Fig. 37. *t'''.* A tubercle in the substance of which a vascular loop (arteriole?) can be clearly seen. Such vessels ultimately cease to be permeable. Magnified 20 diameters.

irregularly scattered. Those ultimate tubercle-granulations which have escaped this process, whether lying isolated or seated in the peripheral portion of larger nodules, appear at first sight, for the most part, to consist merely of a delicate reticulum infiltrated with innumerable lymphoid cells, very similar to the reticulum and cells of the normal adenoid tissue of the intestinal closed glands, or of a little group of lymphoid cells between which no reticulum can be distinguished. These lymphoid elements were the only cells believed to be essential to tubercle by Virchow as late as 1865; they are still regarded in the same light by some excellent histologists, as, for example, Max Wolff in 1876,* and are admitted on all sides to be the most numerous and most constantly present cellular forms.

* R. VIRCHOW—*Die Krankhaften Geschwülste*, Bd. II, Berlin, 1864–5, Vorlesung 21, S. 637—expressly said: "Das eigentliche Tuberkelkörperchen ist eine wirkliche Zelle, und weder ein blosser Kern, noch ein solider Körper. Wie die leukämischen, typhösen und scrofulösen Zellen, gleicht sie im Wesentlichen den Lymphdrüsen Elementen." He had previously maintained this view in *Die Cellularpathologie*, 2te Aufl., 1859, S. 427, and

The occasional occurrence of other elements in tubercle had indeed long been known. Rokitansky,* as early as 1855, described and figured large nucleated and polynucleated forms which he regarded as mother-cells engaged in the endogenous formation of the smaller elements of the gray granulations. Virchow, in 1858, saw huge branching multinucleated forms in tubercle of the omentum, and supposed them to have originated by the transformation of the fat cells. In his work on tumors† he mentions that similar forms are of frequent occurrence in tubercles situated in dense fibrous parts, but by no means represents them as essential to the idea of tubercle.

These large multinucleated elements, now generally known as giant-cells, were also observed in the tubercles of certain tissues and organs by several other histologists,‡ but, so far as I know, Langhans§ (1868) was the first to take the ground that they are constantly present in all tubercles. His studies were made chiefly on teased preparations, in which, besides the multinucleated giant-cells, he succeeded in isolating cells intermediate in size between these and the lymphoid elements, and containing from one to three or more nuclei. Soon after followed the remarkable investigations of Wagner and Schüppel,‖ (1870–71,) made for the most part on thin sections of the diseased tissues, which have been widely accepted as establishing the view that the larger nucleated and giant-cells are the essential elementary forms of the ultimate tubercle-granulation.

According to the beautifully illustrated description of Schüppel, an ultimate tubercle-granulation in a lymphatic gland consists of a reticulum closely resembling that of the adenoid tissue of the lymphatic glands, in the meshes of which lie three kinds of cells, viz:

illustrated it by a diagram representing a tubercle of the pleura, Fig. 140, consisting of a group of small round nucleated cells, surrounded by small lymph spaces filled with similar elements, which he interpreted as proliferating connective-tissue corpuscles. This figure is reproduced in his work on tumors, *loc. cit.*, Fig. 191. MAX WOLFF—*Ueber entzündliche Veränderungen innerer Organe nach experimentell bei Thieren erzeugten subcutanen käsigen Heerden mit Rücksicht auf die Tuberkulosenfrage*, Virchow's Archiv, Bd. LXVII, 1876, S. 234—with a full knowledge of the recent investigations to be presently alluded to, declares that he has recently frequently (hinreichend oft) found tubercles even in the pleura and omentum in which the reticulum was absent, and not merely the inconstant giant-cells, [den inconstanten Riesenzellen,] but also the epithelioid elements were wanting, so that the tubercles consisted merely of a group of round cells in which frequently the central part of the nodule was already converted into a detritus of fatty granules justifying the old definition of tubercle as a small-celled new formation: "Und die alte Definition des Tuberkels als einer kleinzelligen Neubildung nach wie vor zu Recht bestand," S. 251.

* C. ROKITANSKY—*Lehrb. der Path. Anat.*, 3te Aufl., Bd. I, Vienna, 1855, S. 291, Fig. 121. The figure is evidently drawn from a teased preparation and represents, besides nuclei set free by the destruction of the cellular forms and lymphoid cells, larger cells containing two to five or more nuclei, evidently the epithelioid (or endothelial) forms which will be presently described.

† R. VIRCHOW—*Reizung und Reizbarkeit*, Archiv, Bd. XIV, 1858, S. 49—after describing these large multinucleated branching cells as occurring in the lymphatic glands, under what circumstances he does not explain, adds: "Genau dieselben Formen fand ich später im Netz des Menschen bei tuberkulöser Peritonitis und ich konnte mich bestimmt überzeugen, dass sie hier aus metamorphosirten Fettzellen ihre Entstehung nahmen." See, also, S. 639 *et seq.*, in *Die Krankhaften Geschwülste*, [cited note *, *supra*.]

‡ As, for example, in tubercle of the liver, by E. WAGNER—*Die Tuberculose der Leber.*, Archiv der Heilkunde, Jahrg. II. 1861, S. 35—who, however, described them as only of occasional occurrence: "Bisweilen endlich finden sich sehr grosse, graubräunliche Körper mit spärsamen oder zahlreichen, meist kurzen, schmalen, spitz endenden Ausläufern und von platter Gestalt; sie erscheinen meist fein granulirt, zeigen aber nach Essigsäure sehr zahlreiche, meist mittelgrosse, runde oder längliche Kerne, welche grösser und deutlicher bläschenförmig als die obengenannten sind (sogen. plaques à plusieurs noyaux.") So also F. BUSCH—*Zwei Fälle von Geschwulstbildung im Augenhintergrunde*, Virchow's Archiv, Bd. XXXVI, 1866, S. 448—observed these forms in a case of "Tuberculosis chorioideæ;" and they were also seen and figured by K. KÖSTER—*Ueber fungöse Gelenkentzündung*, Virchow's Archiv, Bd. XLVIII, 1869, S. 95, also Taf. III—in tubercles of the synovial membrane.

§ TH. LANGHANS—*Ueber Riesenzellen mit wandständigen Kernen in Tuberkeln und die fibröse Form des Tuberkels*, Virchow's Archiv, Bd. XLII, 1868, S. 382, also Taf. VII–VIII. Figs. 4 and 5 are said to have been drawn from sections, but these were evidently minute fragments, rather than such as served for the studies of WAGNER and SCHÜPPEL. His conclusions are well expressed in the following sentence: "Wie mir genauere Untersuchung einer grösseren Zahl von Fällen ergab, sind diese Riesenzellen in der That ein fast constanter Bestandtheil von Tuberkeln in fast allen Organen des menschlichen Körpers."

‖ E. WAGNER—*Das tuberkelähnliche Lymphadenom*, Archiv der Heilkunde, Jahrg. XI, 1870, S. 497, also Taf. VI u. VII; same Jour., Jahrg. XII, 1871, S. 1. As the title of this admirable paper shows, the writer supposed that he was describing, not tubercle, but a special form of growth resembling tubercle only in external appearance. To any one who may now doubt this fact, I commend the following passage from the first paper, S. 498: "Das knötchenförmige und dann häufig miliare Lymphadenom der Pleura gleicht nach Zahl, Grösse, Anordnung u. s. w. der Knötchen so vollständig dem Tuberkel dieser Haut, dass nur die mikroskopische Untersuchung darüber Aufschluss giebt." When, then, the author in a later publication—*Manual of General Pathology*, Amer. Transl. of 6th German Ed., New York, 1876, p. 445—repeats the description given in his former papers, but now very properly making it generally applicable to typical tubercle, it is somewhat amusing to find him claiming priority as follows: "The histology, just given, of tubercle of the most different organs is by the author. SCHÜPPEL determined it in a special manner, with respect to the lymph-glands," &c., without any mention of his original misconceptions. OSKAR SCHÜPPEL—*Untersuchungen über Lymphdrüsen-Tuberkulose*, Tubingen, 1871, S. 84. I have selected this paper as the basis of the short description given in the text, partly on account of the clearness of the descriptions, partly because of the beauty of the illustrative plates. I may add that SCHÜPPEL was not misled by WAGNER's original article, the first part of which he mentions, remarking: "Die Knötchen in den Lymphdrüsen, welche Wagner als tuberkelähnliches Lymphadenom bezeichnet, während ich sie schlechthin Tuberkel nennen will," &c., S. 6.

giant-cells, large epithelioid (or endothelioid) cells, containing one or more nuclei, and small round lymphoid cells. The giant-cells are rounded, elliptical or irregularly oblong branching masses of very finely granular protoplasm, of various sizes, somewhere between $\frac{1}{100}$ and $\frac{1}{500}$ of an inch in diameter being the usual limits; they are found on examination to contain from half a dozen to thirty, fifty or even more oval nuclei, for the most part situated, with their long diameters arranged as radii, in the peripheral portion of the protoplasmic mass. Each ultimate tubercle-granulation contains usually a single centrally situated giant-cell, or several may be found, without it being possible to affirm from the arrangement of the other elements that the granulation is made up by the confluence of several smaller ones. The larger epithelioid cells lie in the meshes of the reticulum nearest the giant-cells; they are rounded, oval or somewhat polygonal cells, 6 to 8 ten-thousandths of an inch in long diameter, composed of a finely granular protoplasm, and containing one to four or more rounded or oval nuclei 3 to 6 ten-thousanths of an inch in diameter. Beyond these larger epithelioid cells the meshes of the reticulum are stuffed with a swarm of ordinary lymphoid elements, which forms the peripheral portion of the tubercle.

This description, drawn from tubercle of the lymphatic glands, was found by Wagner to apply to the tubercles of various other organs, among them, to tubercles of the intestine.* Substantially the same views of the minute anatomy of the ultimate tubercle-granulation have since been adopted by many histologists, among whom I may particularly mention Thierfelder and Friedländer.† The latter has gone so far as to affirm the tubercular nature of various quite local processes, such as lupus and certain skin ulcers, on the ground that they contain nodules such as have just been described.

As to the origin of the giant-cells there is considerable diversity of opinion. Virchow‡ suggested that those observed by him in certain tubercles were perhaps merely small lymphatic vessels filled with swollen proliferating endothelium, and seen in section; but confessed that he had been unable to demonstrate to his own satisfaction that such was actually the case. This view, rejected by Langhans, has been adopted as the most probable by Hering.§ Klebs‖ has expressed the same opinion in a somewhat modified form; according to him the ultimate tubercle-granulations originate in the interior of small lymphatic vessels, the endothelium of which swells and proliferates, but the central portion at least of the giant-cell is probably formed by the coagulation of an albuminous substance contained in the lymph. Schüppel, on the other hand, seeks the origin of the giant-cells in the interior of the small bloodvessels; in a special essay on the subject,¶ he derives them from little non-nucleated masses of protoplasm, possibly coagulated fibrin, which are arrested in the minute vascular twigs, and in which nuclei subsequently arise. An origin

* E. WAGNER—second paper cited in note ‖, p. 589, *supra*. He found the giant-cells, &c., in many of the ultimate tubercle-granulations in the vicinity of the intestinal ulcers.

† A. THIERFELDER—*Atlas der Path. Histologie*, 1 Lief., Leipsic, 1872, Taf. V, Fig. 2—gives a beautiful figure of the structure in question as seen in a miliary tubercle of the lung. C. FRIEDLÄNDER—*Ueber locale Tuberculose*, No. 64, Sammlung Klinischer Vorträge, herausgegeben von R. Volkmann, Leipsic, 1873.

‡ *Die Krankhaften Geschwülste*, Bd. II, Berlin, 1864–5, S. 641.

§ LANGHANS—*op. cit.*, p. 589, *supra*. THEODOR HERING—*Hist. und Exp. Studien über die Tuberkulose*, Berlin, 1873, S. 105: "Riesenzellen des Tuberkels höchst wahrscheinlich Lymphgefässdurchschnitten entsprechen."

‖ KLEBS—*Ueber die Entstehung der Tuberculose und ihre Verbreitung im Körper*, Virchow's Archiv, Bd. XLIV, 1868, S. 286–289. KÖSTER—S. 114, *op. cit.*, p. 589, *supra*—also regards this view as highly probable, and intimates that it is supported by observations of his own, the publication of which was rendered unnecessary by the beautiful investigations of KLEBS.

¶ In an earlier essay SCHÜPPEL—*Zur Histogenese der Lebertuberculose*, Archiv der Heilkunde, Jahrg. IX, 1868, S. 524—derived the elements of tubercle from the white corpuscles of the blood, (S. 536,) but not the giant-cells, as has been erroneously asserted by BRODOWSKI, (S. 114, *op. cit.*, *infra*,) for he expressly declares that he found no giant-cells in tubercle of the liver. In his work on tubercle of the lymphatic glands, S. 92–94, *op. cit.*, p. 589, *supra*, he suggested that they might arise from the coalescence (verschmelzung) of endothelial elements or white corpuscles in the interior of the small bloodvessels; possibly a little mass of some coagulated albuminous body formed the central portion of the giant-cell. The views expressed in the text will be found in his essay *Ueber die Entstehung der Riesenzellen im Tuberkel*, Archiv der Heilkunde, Jahrg. XIII, 1872, S. 69; also Plate I.

from the small bloodvessels, though in a modified way, is also maintained by Brodowski,* according to whom a tubercle represents an aborted attempt at the new formation of a bloodvessel, and the giant-cells arise by the transformation of protoplasmic buds in the vascular walls. Meanwhile, according to others, especially Buhl and Rindfleisch,† the giant-cells, and with them the tubercles, may arise from any endothelial elements: from those that cover the surface of serous membranes and those that imperfectly line the lymph spaces of the connective tissue, (connective-tissue corpuscles,) as well as from those of the inner coat of the minute bloodvessels and lymphatics. Lastly must be mentioned the opinion supported by Ziegler,‡ on the basis of his ingenious experiments, that the giant-cells are derivatives of the white blood corpuscles.

The mere enumeration of these conflicting views is sufficient to awaken the suspicion that the observations by which they are supported are not of the most convincing kind, and a perusal of the several papers which have been cited confirms this view. Nor has the opinion that the giant-cells are especially characteristic of tubercle been received without opposition. To the fact, admitted by Friedländer,§ that they occur in morbid conditions not usually admitted to be tubercular, it must be added that they occur also in morbid growths which are certainly not of this nature; accordingly their significance as elements peculiar to tubercle is denied by many histologists, among whom I may particularly mention Klebs, Hering, Buhl, Rindfleisch, Brodowski and Max Wolff.‖ The French histologists have never accepted the doctrine of the giant-cells, but have either regarded their presence as of little importance, or have boldly declared that the name has been bestowed upon appearances which are properly to be interpreted as transverse sections through bloodvessels filled with coagula in which endothelial cells and lymphoid elements are entangled. In

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* W. BRODOWSKI—*Ueber den Ursprung sogenannter Riesenzellen und über Tuberkeln im Allgemeinen*, Virchow's Archiv, Bd. LXIII, 1875, S. 113. He proposes for these little protoplasmic masses the term angioblasts or angioplasts, S. 126.

† BUHL—*Lungenentzündung, Tuberkulose und Schwindsucht*, 2te Aufl., Munich, 1873; I cite the Amer. Transl., New York, 1871, p. 27: "My view demands, then, only the existence at the point of irritation, of a pre-existing element from the series of connective-tissue corpuscles and endothelium, chiefly from the endothelium of the lymphatics and serous membranes, from which the new lymphatic growth may develop and become further organized." E. RINDFLEISCH—*Chronische und acute Tuberkulose*, in Ziemssen's Handb., Bd. V, Abth. 2, Leipsic, 1874, S. 163; I cite the Amer. Transl., Vol. V, New York, 1875, p. 644: "It has already been taught by many that the vascular connective-tissue system of the body is in general the tissue in which tubercles are developed. Within this system we must distinguish mobile and stable cellular elements. To the mobile elements belong the blood globules and the wandering cells; to the stable the endothelium of the blood-vessels and of the lymphatics, the epithelium of the serous membranes, and the fixed connective-tissue cells. It is from these latter elements, from the fixed cells of the vascular connective-tissue system, that the miliary tubercle, in my opinion, originate. Many of the more recent authors regard the formation of a giant-cell as always the first step. But I believe that a giant-cell is nothing but an endothelial or a connective-tissue cell enlarged, and with an increased number of nuclei." Compare, by the same, *Die chronische Lungentuberculose*, Deutsches Archiv für Klinische Medicin, Bd. XIII, 1874, S. 43. E. KLEIN—*The Anatomy of the Lymphatic System. II. The Lung*, London, 1875, p. 75—derives the giant-cells in lung tubercle from the alveolar epithelium.

‡ ERNST ZIEGLER—*Experimentelle Erzeugung von Riesenzellen aus farblosen Blutkörperchen*; vorläufige Mittheilungen, Centralblatt für die Med. Wiss., Jahrg. XII, 1874, S. 891 u. 913; also *Exp. Untersuch. über die Herkunft der Tuberkelelemente mit besonderer Berücksichtigung der Herkunft der Riesenzellen*, Wurzburg, 1875—inserted small glass plates 10–20 mm. long by 10 broad, to each of which a covering-glass of the same size was cemented, so as to leave a minute capillary space between the two, beneath the skin or periosteum, or into the cavities of the bodies of rabbits and dogs. The plates were left from 10–25 days, then removed, soaked for two days in a one per cent. osmic-acid solution, and afterwards immersed in glycerine. In all cases white blood corpuscles were found to have wandered between the glass and the cover; in some cases retrogressive changes had commenced in these; in others progressive changes had taken place, manifested in some instances by the development of connective tissue and bloodvessels, in others by the formation of a reticular tissue with epithelioid cells and giant cells resembling in the most striking manner those of tubercle. He concluded from these observations that the giant-cells are formed out of the colorless blood corpuscles. Compare G. WEISS—*Ueber die Bildung und die Bedeutung der Riesenzellen*, Virchow's Archiv, Bd. LXVIII, 1876, S. 50—who derives the giant-cells formed around foreign bodies from the confluescence of "granular cells."

§ FRIEDLÄNDER—*op. cit.*, p. 590, *supra*.

‖ Thus, KLEBS—S. 230, *op. cit.*, p. 590, *supra*—mentions having found them in a foot affected by elephantiasis. HERING—S. 137, *op. cit.*, p. 590, *supra*—declares that they occur in various new formations and pathological processes, and infers that their occurrence in tubercle is of no specific significance. BUHL—p. 93, *op. cit.*, note †, *supra*—declares that "there are tubercle-lymphoma in which we seek in vain for the giant-cells, at any stage of their existence; and in others, if a giant-cell develops early, it perishes later on, and in this way we may fail to find it. Again, it is difficult to discover genuine histological marks of distinction—that is, belonging to the cell itself, between other well-known giant-cells (for example, those on the inner surface of the periosteum, in growing bone, in myeloid sarcoma, true myoma, epithelial new growths, etc.) and those which we find in tubercle-lymphoma." RINDFLEISCH—pp. 644–5, Amer. Transl., *op. cit.*, note †, *supra*—declares that though he has often used these cells "as a sort of sign-post in his studies of tubercle, "no special reliance can be placed on them. They occur in many non-tubercular new-growths," &c. BRODOWSKI—S. 127, *op. cit.*, note *, *supra*—found them in lupus, in syphilitic gummata, in the margins of chronic leg ulcers, in glanders (Rotzknötchen) of the human nasal mucous membrane, &c. The views of MAX WOLFF have been already mentioned: see note to p. 588, *supra*. Here, too, I may refer to the debate on the tubercle question in the Versammlung Deutscher Naturforscher und Aerzte in Wiesbaden, (1873,) Berliner Klinische Wochenschrift, Jahrg. X, 1873, S. 518, in which Virchow declared himself in the strongest manner against accepting the structure described by SCHÜPPEL as the criterion of tubercle.

the latest utterances of Cornil and Ranvier on the subject of lung tubercle I find this latter view maintained with considerable warmth.*

In view of the contradictory interpretations of the German histologists, it is not surprising that the opinion of Rindfleisch,† who regards the epithelioid cells rather than the giant-cells as the essential elements of tubercle, should have begun, as we learn from the communication of Max Wolff,‡ to find favor in many quarters in Germany. But Rindfleisch himself admits that the stage in which these large epithelioid cells, which he boldly designates "tubercle-cells," are produced is not always reached. According to him, their development represents the acme of the process, and hence their presence is hardly to be expected in the earlier stages of the growth.

As for the only other remaining cellular forms, the small round cells which are constantly present in tubercle, it is generally conceded that they possess no specific characters. The opinion of Buhl,§ that there are unmistakable differences between them and white corpuscles, or lymph cells, has not been generally accepted, and certainly does not correspond with my own observations. Nor can the specific characters, which have been vainly sought in the cells of the ultimate tubercle-granulation, be found in the reticulum, upon the existence of which so much stress has been laid by both Wagner and Schüppel. I cannot wholly agree with Friedländer,‖ who declares it to be a mere artificial product, only seen in chromic-acid preparations, and resulting from the action of that reagent, for, unlike him, I have quite frequently seen it well marked in preparations hardened by alcohol and mounted in Canada balsam. The reticulum is, however, far from being a constant element in tubercle. According to Buhl,¶ it is less and less marked the younger the growth, and is entirely wanting in the earliest stages, the cells being then in contact with each other. Whether this is a correct statement of the actual circumstances or not, the frequent absence of any reticulum in the ultimate tubercle-granulations has been noted by several observers, among

* The reader desirous of following the progress of recent French investigation of the histology of tubercle may consult especially: E. Bouchut—*Traité Pratique des Maladies des Nouveau-nés*, etc., 4me Éd., in which will be found an account of the histology of lung tubercles prepared with the collaboration of Ch. Robin; see, also, 5me Éd., Paris, 1867, p. 367 *et seq.*; G. S. Empis—*De la Granulie*, Paris. 1865, p. 41 *et seq.*; Herard et Cornil—*De la Phthisie Pulmonaire*, Paris, 1867; Cornil—*Du tubercule, spécialement étudié dans ses rapports avec les vaisseaux*, Archives de Phys., T. I, 1868, p. 98, (also Plate 2;) Cornil et Ranvier—*Manuel d'Histologie Path.*, Partie 1, Paris, 1869, p. 199 *et seq.*; J. Grancher—*Étude sur le tubercule et la pneumonie caséeuse*, Arebives de Phys., T. IV, 1871-2, p. 624, and Plate 22, Figs. 1-7; also by the same—*De l'unité de la phthisie*, Paris Thesis, No. 50, 1873. According to this author giant-cells are sometimes to be seen in tubercle-granulations; but "Elles n'ont pas une grande signification en ce qui touche l'origine du tubercule," p. 27. Some of them are possibly formed by the fusion (accolement) of several cells, or by the multiplication of the nuclei of a single cell, but others do not merit the name of giant-cells, they are mere intra-vascular coagula of an albumino-fibrinous nature. L. Thaon—*Recherches sur l'Anat. Pathologique de la Tuberculose*, Paris, 1873, p. 14 *et seq.*—declares that he has vainly searched for giant-cells in tubercle: "We have seen, it is true, almost constantly in the interior of the granulations, figures quite similar to giant-cells, but these figures are to be referred to the transverse sections of vessels in which fibrin and round cells have accumulated," p. 16. Cornil et Ranvier—*Manuel d'Histologie Pathologique*, 2me Partie, Paris, 1873. See especially the account of tubercles of the bones, p. 377, the lymphatic glands, p. 536, and tubercular meningitis, p. 607; also 3me Partie, Paris, 1876, in which see especially the account of lung tuberculosis, p. 717 *et seq.*, intestinal tuberculosis, p. 850, tubercular peritonitis, p. 963, tubercles of the spleen, p. 993, kidneys, p. 1074, etc. These authors speak in no uncertain language: "The bloodvessels are always obliterated in tubercular nodules, and very often in the surrounding embryonic tissue. * * * The vessels seen in transverse sections exhibit their lumen filled with granular fibrin, and between this coagulum and the vascular wall a row of white globules and endothelial cells can be seen. White globules may also be entangled in the centre of the coagulum. In recent tubercles the wall of the vessel is readily distinguished: but if the centre of the tubercle has already undergone cheesy degeneration, this wall itself is altered and indistinct, it becomes indistinguishable from the cheesy tissue that surrounds it. If the preceding alterations were unknown, it would be impossible to say what the little granular nucleated mass, occupying an ill-defined cavity in the centre of the granulation, was due to. Schüppel has described these elements and the granular substance that surrounds them as giant-cells formed of a granular protoplasma and provided with nuclei. He regards them as characteristic of tubercle. But there are no giant-cells here, simply a coagulation of fibrin and cells previously formed, the nature of which we long ago indicated. After having hesitated as to their mode of formation, Schüppel, without citing our works, has ended by discovering that these pretended giant-cells are developed in the interior of the vessels," p. 719. On the other hand, Charcot, if I may judge from the abstract of his lectures on *Pulmonary tuberculosis and caseous pneumonia*—Med. Times and Gaz., Vol. I, 1878, p. 29—accepts the doctrine of the occurrence of giant-cells in tubercles, and the view of Brodowski as to their origin. The former belief is clearly stated in his *Note sur la pneumonie caséeuse*—Bull. de la Soc. Anat. de Paris, An LII, 1877, p. 477—"On se rappelle que le tubercule, lorsqu'il est isolé, offre à son centre une cellule géante entourée de cellules épithélioïdes en dehors desquelles se voient de nombreux noyaux."

† Rindfleisch—p. 642-3, Amer. Transl., *op. cit.*, note †, p. 591, *supra*.

‡ Max Wolff—S. 251, *op. cit.*, p. 588, *supra*.

§ Buhl—p. 92, *op. cit.*, p. 591, *supra*. The only difference he mentions is that the tubercle cells and particularly their nuclei are smaller and more glistening: an appearance which I suppose is observed only after degenerative changes have commenced. At any rate, these characters are to be observed only in the central parts of the tubercles: the round cells in the peripheral parts differ in nothing from the lymphoid cells seen in other morbid processes.

‖ Friedländer—S. 516 note, *op. cit.*, p. 590, *supra*.

¶ Buhl—*loc. cit.*, note §.

others especially by Max Wolff. In the absence of specific characters in any of its elements, we can therefore as yet find no anatomical characteristics peculiar to tubercle, except the grouping of the elements in the form of the ultimate granulations and the marked tendency to central cheesy metamorphosis.

Since the publication of the researches of Wagner and Schüppel I have reëxamined the histology of intestinal tubercle, using for the purpose especially the alcoholic preparations in the Museum, from which I have had a considerable number of thin sections cut, stained with carmine and mounted in Canada balsam. Studied with a power of 250 to 500 diameters or upwards these preparations exhibited the following structural details: Those of the smallest, presumably the youngest tubercle-granulations in the submucous connective tissue, through the midst of which the sections had fairly passed, presented central figures $\frac{1}{500}$ to $\frac{1}{250}$ of an inch in diameter, or even larger. These, for the most part, were rounded or oval in form, and bounded by a distinctly recognizable external wall, like that of a small vein or lymphatic vessel cut across. The space within this boundary was generally filled with a granular or indistinctly fibrillated material resembling coagulated fibrin, entangling in its substance a number of cells; some resembling endothelial elements, and these usually lay on the periphery; others, and these the most numerous, ordinary lymphoid cells. Outside of the limiting wall of the central figure the granulation was made up of two kinds of cells: large, oval, nucleated cells, corresponding in size and form to the swollen endothelial elements seen in chronic inflammations of the submucous connective tissue of the intestine;* and a swarm of small round cells resembling ordinary lymphoid elements. The relative numbers of these two kinds of cells varied very greatly. The small round cells occurred sometimes in moderate numbers, chiefly on the periphery of the granulation; sometimes they infiltrated all parts of it, and were so numerous as to obscure the large oval cells, which, however, with a good immersion objective, could generally still be recognized between them. All these elements lay in the meshes of a fibrillated reticulum, continuous with the surrounding connective tissue, as shown in Fig. 37, which represents a very small tubercle-granulation from the submucosa of the ileum of case 413.

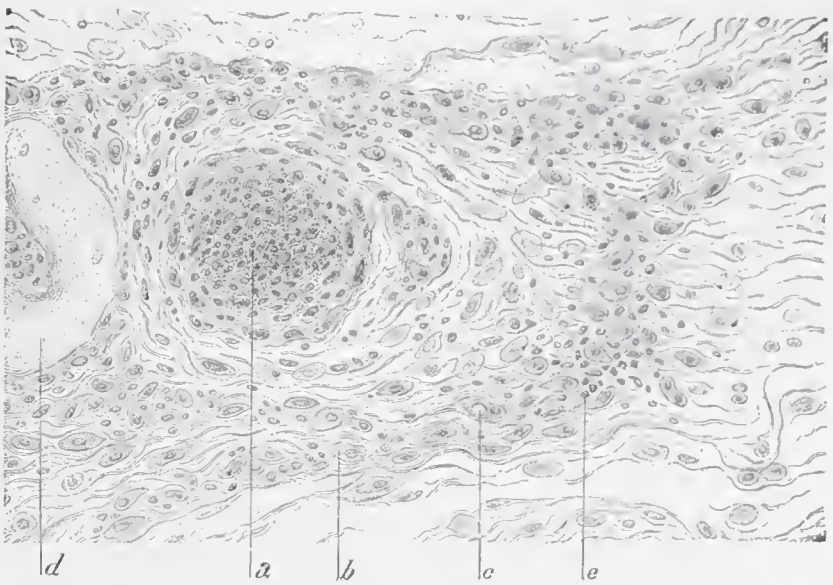


FIG. 39.—Small tubercle in the submucosa of the ileum. From the same case as Fig. 37. Magnified 370 diameters by Powell & Lealand's immersion $\frac{1}{4}$th. Copied from a photo-micrograph (Neg. 988, N. S.) of a part of No. 7541, Microscopical Section. *a*. Central figure (lymphatic) cut across; it is stuffed with granular fibrin, in which lymphoid elements, and on the periphery endothelial cells, are imbedded; indications of the limiting wall and of a small branch are also seen. In the space around the central figure are numerous granular nucleated endothelial cells like that indicated at *b*. In one of these cells, *c*, a vacuole has formed. There are also numerous lymphoid elements; a group of four is indicated at *e*. A small vein, *d*, passes through the margin of the tubercle. Traces of a fibrillated connective-tissue matrix are seen everywhere, outside of the central figure, between the elements.

* See pp. 326, 468–70 and 571, *supra*.

As to the significance of these parts, I incline to interpret, with Virchow, the central figure as a lymphatic vessel cut across,* rather than with Cornil and Ranvier as a bloodvessel. If a bloodvessel, it must be a small vein; for the walls are much too thin for an artery of the same diameter. But the veins in other parts of the sections show no particular indications of disease, while the lymphatics everywhere exhibit more or less tumefaction of their endothelial elements, which in many places are so swollen as almost or quite to fill the lumina of the vessels, giving rise in all parts of the sections not occupied by the tubercles to characteristic figures filled with large cells more or less polyhedral from mutual pressure. These may be seen in the submucosa, between the circular and longitudinal muscular coats, and in the subperitoneal connective tissue. When the section passes through them transversely or obliquely they appear as rounded or oval figures, as in Fig. 40; when it runs parallel to their course, as more or less elongated cylinders; in either case they are lined, or quite stuffed, with large granular oval or more or less polyhedral cells with large oval or round nuclei. Occasionally such a vessel may be encountered in which a part of the lumen is filled by what appears to be a small fibrin-clot adhering to one side of its wall, entangling in its substance endothelial and lymphoid cells, while similar cells lie free in the remainder, as in Fig. 41, on the next page.

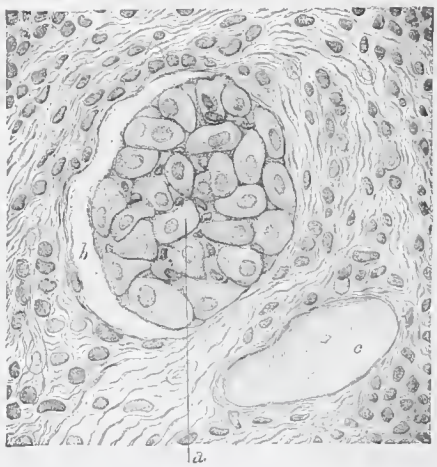


FIG. 40.—Transverse section through the lumen of a diseased lymphatic vessel in the submucosa of the ileum. Same case as Fig. 37. Magnified 480 diameters by Powell & Lealand's immersion $\frac{1}{25}$th. Copied from a photo-micrograph (Neg. 986, N. S.) of a part of No. 7541, Microscopical Section. The lumen of the vessel was filled with a mass of large endothelial cells, *(a.)* between which a few lymphoid elements have crept. In preparing the specimen this mass has shrunk away from the wall of the vessel, leaving a space, *b*. In the neighborhood of this stuffed lymphatic the section passes through a venous radicle, *c*. The surrounding connective tissue is infiltrated with lymphoid elements and presents also a few large endothelial cells.

A larger fibrin-clot, completely filling the vessel and entangling similar elements in its interior, forms, I suppose, the round or oval figure seen in the centre of the young tubercle-granulation. It is easy to understand that some of these figures, if shrunken by the more potent influence of chromic-acid hardening instead of being hardened by alcohol alone, would bear a striking resemblance to the descriptions of giant-cells. Indeed I have seen, in sections of tubercular intestines thus treated, a number of figures which had this appearance, and in alcoholic preparations have occasionally encountered similar ones, but on carefully examining these with high powers have found them to be mere modifications of the conditions just described. I incline, therefore, to regard the so-called giant-cells, in intestinal and peritoneal tubercles, as figures resulting from the action of chromic acid on sections of lymphatic vessels stuffed with coagulated fibrin. The large endothelioid elements of the primary tubercle-granulation outside its central figure, I suppose to be formed by mere enlargement of the endothelial elements of the lymph spaces in the connective tissue. These elements are not always limited to the tubercle-granulations.

* The first speculation in this direction was that of SYLVIUS, who plainly taught—*Appendix*, Tract. IV, § 59, *op. cit.*, note ‡ p. 575, *supra*—that lung-tubercles originate by the enlargement of little lymphatic glandulæ, normally quite invisible to the naked eye. Nearer to the truth was the doctrine of BROUSSAIS—*Hist. des Phlegmasies*, 3me Ed., T. II, Paris, 1822, p. 1, *et seq.*—who held that phthisis originates from an "inflammation lymphatique" of the lungs, the tubercles being derived from the lymphatic capillaries of these organs. This latter conjecture finds a solid support in the observations of VIRCHOW, HERING and KLEBS—see p. 590, *supra*—and in the account of lymphangitis nodosa, given by RINDFLEISCH—*Lehrb. der path. Gewebelehre*, 3te Aufl., Leipsic, 1873, § 451, S. 378—as well as in the observations recorded in the text. I by no means suppose this morbid process to be the only one that gives rise to what are commonly called tubercles, or doubt that, under certain conditions, "giant-cells" may be formed in the testicle from the epithelium of the tubuli seminiferi—J. GAULE, *Anat. unters. über Hodentuberculose (Phthisis testis,)* Virchow's Archiv, Bd. LXIX, 1877, S. 221—or in the kidney from the tubuli uriniferi—*op. cit.*, S. 225—or from the epithelium of the lung-alveoli—see KLEIN, note †, p. 591, *supra*. Nor will I enter here into the question whether the term tubercle should be refused to these processes, as GAULE suggests; but may point out that a formation of tubercles having their origin in the lymphatics of the interstitial connective tissue, is also probable in all these cases. Compare, for example, in connection with the testis, MALASSEZ—*Note sur le siége et la structure des granulations tuberculeuses du testicule*, Archives de Phys., T. III, 1876, p. 56.

In several specimens in which the tubercle-formation was accompanied by a protracted intestinal catarrh I have found them in all parts of the submucosa. Figure 12, on the next page, shows the condition of the submucosa in such a specimen. The part selected for representation was situated at some distance from any of the tubercles.

The cheesy metamorphosis of the ultimate tubercle granulations appears to commence in the contents of the central lymphatic, but it speedily invades the adjacent exterior elements, and then all trace of a wall is lost and the central portion of the tubercle appears simply occupied by a granular mass in which shrivelled nuclei are imbedded. This granular mass passes by gradual transitions into the part of the tubercle in which the elements are as yet unchanged; and in this transition-territory the round cells particularly are more or less shrunken and altered, so that they appear smaller and more highly refractive than the more peripheral ones in which degenerative changes have not yet commenced.

If the foregoing descriptions are substantially correct, the development of the ultimate tubercle-granulation would seem to be determined by the formation of a fibrin-clot obstructing a small lymphatic vessel. Around the vessel, at the point of obstruction, lymphoid cells accumulate in a group. According to this view the lymphoid cells are to be regarded as representing probably a swarm of migrated white corpuscles, while the large endothelioid elements are produced by the gradual enlargement of the fixed corpuscles of the area of connective tissue involved.

If we seek for the momenta by which the process is determined, we are led at once into the realm of conjecture. According to Buhl* the necessary stimulus is supplied by those convenient bacteria which have played so conspicuous a part in modern pathological speculations. These circulate with the blood-stream, bore into the protoplasm of some doomed endothelial cell in the walls of a small vein, increase up to a certain point at its expense, and stimulate it to growth and nucleus-multiplication. This opinion appears to be based upon the erroneous supposition that the contents of the so-called giant-cells are actually spherical bacteria, which Friedlander, and especially Max Wolff,† have disproved by the use of reagents.

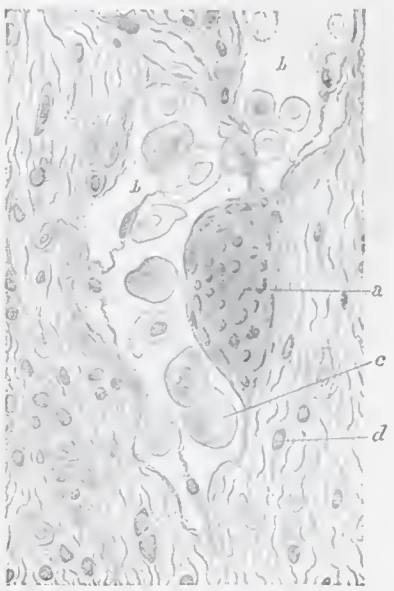


FIG. 41.—Section through the lumen of a lymphatic in the submucosa of the ileum. Same case as Fig. 37. Magnified 480 diameters by Powell & Lealand's immersion $\frac{1}{25}$th. Copied from a photo-micrograph (Neg. 185, N. S.) of a part of No. 7541, Microscopical Section. *A* granular fibrin-clot, *a*, in which both lymphoid and endothelial elements are imbedded, adheres on one side to the walls of a lymphatic vessel, in whose lumen, *b*, *b*, loosened endothelial elements lie free. Similar elements appear in the connective tissue surrounding the vessel, with a number of lymphoid elements, one of which is indicated at *d*. See p. 594.

It is easier to conceive reasons for the central cheesy degeneration with which sooner or later the tubercle-granulation is inevitably smitten. This is generally accounted for by the fact that the nodules are never penetrated by blood-carrying vessels. No new formed vessels arise in their substance, and in any that may be embraced by their growth the circulation speedily ceases. This circumstance alone hardly suffices to account for the facts, for tubercles are often seen in which the central degeneration is well advanced, although

* BUHL—p. 115, *op. cit.*, p. 591, *supra*.

† FRIEDLÄNDER—S. 516, *op. cit.*, p. 590, *supra*—remarks: "The protoplasm of these giant cells is characterized by a very homogeneous, tolerably dark granulation, which gives it, on superficial observation, some similarity to certain forms of bacteria colonies. A few investigators have, therefore, without anything further, interpreted the dark granules of the giant-cells as micrococci; but the simple reaction of potash solution, which immediately dissolves the granules, especially on the application of moderate warmth, shows that this opinion is untenable." MAX WOLFF—S. 261 *et seq. op. cit.*, note * to p. 588—has shown that the same result is produced by other reagents, especially acetic acid. He has also established the absence of actual bacteria or micrococci in any of the elements of recently formed tubercle.

the whole nodule is so small that the distance from its centre to the bloodvessels on the periphery is not greater than is found quite compatible with the nutrition of certain healthy tissues and of non-vascular morbid products in vigorous individuals. But when, in addition to this circumstance, we consider the diminished vitality which the elements of the new formation must share with the organism in which they arise, the result will not appear surprising. Be the cause what it may, central cheesy degeneration sometimes commences at a very early stage. Max Wolff* declares that he has seen tubercles composed merely of a little group of round cells, in the central portion of which the transformation to fatty detritus had already commenced. I have myself seen very small nodules, cheesy in the centre, on the periphery of which numerous small round cells, but none of the enlarged endothelioid elements, could be recognized, the degeneration having antedated their formation. The shrivelled nuclei which abide in the granular detritus produced by the cheesy metamorphosis are the so-called tubercle-corpuscles which were described by Lebert and Gluge† as specific elements, a doctrine which was widely accepted until it was shown by Virchow‡ that they may be produced by the caseous metamorphosis of almost any cellular mass, from the products of ordinary inflammation or even from sarcoma or cancer. In tubercle, as in these other cases, they are mere results of the process of necrobiosis.

FIG. 42.—Portion of the submucosa of the ileum from the same case as Fig. 37. Magnified 480 diameters by Powell & Lealand's immersion $\frac{1}{25}$th. Copied from a photo-micrograph (Neg. 987, N. S.) of a part of No. 7541, Microscopical Section. In the meshes of the fibrillated matrix there are a number of large granular nucleated cells (transformed connective-tissue corpuscles, endothelial cells,) one of which is indicated by *a*, and numerous smaller lymphoid elements, two of which are indicated by *b*. See p. 595.

We have already seen that, when in the study of thin sections we approach the edges of a tubercular ulcer, the submucous connective tissue between the ulcers is found to become more and more infiltrated with a dense swarm of lymphoid elements, quite like those which occur in the vicinity of ordinary intestinal ulcers. It is easy in such sections to see that the enlargement of the tubercular ulcer is effected by a double process; in part by the dropping out into the cavity of the ulcer of the necrotic masses produced by the caseous metamorphosis of the tubercles; in part by liquefaction of the connective-tissue matrix and the floating off of the individual lymphoid elements as pus corpuscles, as has been described in connection with catarrhal ulcers of the intestine.§ The first of these processes produces the peculiar little cavities that give to the edges and bases of the tubercular ulcers the characteristic worm-eaten appearance which is so readily recognized by the naked eye. The small arteries in the vicinity of such ulcers often exhibit various degrees of the so-called amyloid degeneration, manifested by glassy swelling of the intima and indistinctness of the nuclei of the muscular coat. By the use of iodine the characteristic reaction is distinctly produced. I cannot,

* See note to p. 588, *supra*.

† G. GLUGE—*Anat.-mik. Untersuch. zur allg. u. spec. Path.*, Heft II, Jena, 1841, S. 181; also, by the same, *Atlas der path. Anat.*, Jena, 1850, Tuberkel: Taf. I, Fig. 9; Taf. III, Figs. 5, 6, etc.: Taf. IV, Figs. 7, 8, etc.; Taf. V, Figs. 3 and 17. H. LEBERT—*Phys.-path. Untersuch. über Tuberculosis*, Müller's Archiv, Jahrg. 1844, S. 190. See, especially, Abschnitt I, Mikroskopischer Bau der Tuberkeln; also, by the same author, *Phys. Pathologique*, Paris, 1845. T. I, p. 351 *et seq.*, and *Atlas* to the same, Plates VIII and IX.

‡ VIRCHOW—*loc. cit.*, p. 588, *supra*.

§ See p. 567 *et seq.*, *supra*.

nevertheless, in view of the evident participation of tubercle-formation in their production, agree with Colberg* in calling these amyloid ulcers. The amyloid degeneration appears here as a mere complication, the presence or absence of which has not been shown to exercise much influence on the progress of the disease.

What, now, is the behavior of the solitary follicles and the patches of Peyer during the progress of intestinal tuberculosis? In the specimens I have examined they have either been already destroyed by ulceration or converted into cheesy masses surrounded by a dense swarm of lymphoid elements. According to Klebs,† the tubercular process begins in the follicles as a simple swelling produced by the accumulation of lymphoid elements in the parenchyma of the follicles and the surrounding submucous connective tissue. Cheesy metamorphosis, commencing in the centres of the follicles, ultimately leads to their destruction and to the production of the primary tubercular ulcer. Rindfleisch,‡ who gives essentially the same account of the process, refuses, on account of these characters, to regard it as tubercular; according to him it is merely a form of scrofulous inflammation, and the undoubted tubercles in the vicinity are secondary formations originating by infection from the neighboring cheesy mass. Hering§ adopts substantially similar views. I must confess that I regard this interpretation with distrust; and, indeed, all the descriptions of the commencement of the process in the closed follicles are highly unsatisfactory, and further investigations are needed.

According to Wagner,‖ the earliest tubercle-granulations do not make their appearance in the follicles, but, quite independently, in the lower portion of the glandular layer and in the submucous connective tissue just beneath the muscle of Brücke. These nodules are too numerous to be solitary follicles; moreover, the glands of Lieberkühn above them are not arranged as over these follicles, but quite as in the rest of the mucous membrane, except that they are often more or less shortened. With this description my own observations fully agree; but I have seen these conditions only in cases in which the closed follicles of the affected territory were already destroyed by ulceration,¶ so that the nature of the incipient process in the follicles is not explained by this observation.

Klebs has suggested that intestinal tubercles are produced by direct inoculation, the virus being supplied by the secretion from the diseased lungs, more or less of which is constantly swallowed by phthisical subjects. This is a plausible explanation, especially in view of the results of experiments in which tubercular ulcerations of the intestine seem to have been produced by feeding healthy animals with tubercular matter.** But this result is by no means uniformly attained, and moreover this explanation does not account for many of the other secondary deposits of tubercle which occur in cases of phthisis, as, for example, in the meninges of the brain, and in the peritonæum in cases in which the intestinal mucous membrane is not tubercular. If it be necessary to suppose an infection by way of the blood for these cases, why not explain in the same way those in which the intestinal mucous membrane is involved? A thorough discussion of these etiological questions would be out of place in this work, even did space permit; they must, therefore, be passed over with this brief mention.

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* *Loc. cit.*, pp. 335 and 577, *supra*.

† *Loc. cit.*, note ‖, p. 576, *supra*.

‡ P. 366, Amer. Transl., *Op. cit.*, p. 576, *supra*.

§ *Loc. cit.*, note §, p. 590, *supra*.

‖ S. 6 and 7, second paper cited note ‖, p. 589, *supra*.

¶ I am not clear, from WAGNER'S description, *loc. cit.*, that this was not also the case in the intestines he examined.

** Such results are said to have been obtained by VISEUR, as reported by CHAUVEAU—*Faits nouveaux de transmission de la tuberculose par la voie digestive chez le chat domestique*, Bull. de l'Acad. de Méd., T. III, 1874, p. 891; and in the case of herbivorous animals by O. BOLLINGER—*Ueber Impf- und Fütterungstuberculose*, Archiv für Exp. Path. u. Pharm., Bd. I, 1873, S. 362—who, however, did not succeed with carnivorous animals, (dogs.) According to KLEBS—*Die künstliche Erzeugung der Tuberculose*, same Vol., S. 170—the general tuberculosis, which GERLACH—*Ueber die Impfbarkeit*

## 5. Causes of Diarrhœa and Dysentery.

The evidence presented in the previous portions of this chapter will, it is believed, satisfy the reader that the phenomena of diarrhœa and dysentery result from various degrees of irritation or inflammation of the mucous membrane of the alimentary canal. Diarrhœa only, ensues from any degree of irritation that does not amount to actual inflammation. Simple inflammation, whether mild or severe, acute or chronic, with or without ulceration, also gives rise only to the symptoms of diarrhœa, so long as it does not involve the mucous membrane of the sigmoid flexure and rectum to such a degree as to produce tenesmus. When this happens the flux takes on the characters of simple inflammatory dysentery, which is most apt to be the case in the severer forms of the inflammatory process. The diphtheritic inflammation is anatomically, as has been shown, merely a more intense variety of inflammation, which, from the very fact of its intensity, gives to the resulting flux the characters of dysentery. The causes of diarrhœa and dysentery are therefore to be found in the conditions capable of producing irritation or inflammation of the mucous membrane of the alimentary canal. Hence, the attempt to group separately the causes of each variety of flux would lead to needless repetition. Even in the case of diphtheritic dysentery the determining momenta are to be sought chiefly in conditions which intensify and modify the inflammatory process. It seems, therefore, most convenient to discuss in order in this place the several causes which may give rise to irritation or inflammation of the intestinal mucous membrane, and to endeavor to point out in connection with each its relations to the several forms of flux.

These causes may be conveniently divided into two groups: those which act directly upon the intestinal mucous membrane, irritating or inflaming it; and those which produce the like result indirectly in consequence of their primary action upon some other part, or upon the general constitutional condition of the individual. This classification cannot be rigidly maintained, for we shall see that certain causes may act simultaneously in both

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*der Tuberculose*, etc., Virchow's Archiv, Bd. LI, 1870, S. 290—had shown can be produced by the use of the milk of tuberculous cows, begins commonly with an intestinal catarrh, which leads next to tubercular affections of the mesenteric glands, and subsequently of other organs. This is no place to undertake a history of the voluminous, and in many respects contradictory, investigations into the question of the transmissibility of tubercle from individual to individual by inoculation or by feeding; nevertheless it seems proper to allude briefly to the subject. As is well known, modern interest in the matter was aroused by the now celebrated investigations of Villemin—*Cause et nature de la tuberculose*, Bull. de l'Acad. Imp. de Méd., T. XXXI, 1865-6, p. 211; second memoir, same title, same Jour., T. XXXII, 1866-7, p. 152. See also the report of the committee appointed to consider these two communications, same Volume, p. 897, and the report of the discussion which ensued, same Volume, p. 1160 *et seq.*, and T. XXXIII, 1868, p. 75 *et seq.* See also the larger work of Villemin—*Études sur la Tuberculose*, Paris, 1868. In the investigations that followed, while several observers obtained results which appeared to substantiate the conclusion of Villemin that general tuberculosis occurs in animals inoculated by tubercular matter, others arrived at the conclusion that similar lesions occurred when, instead of tubercular matter, any cheesy mass was used as the inoculating material, or from the introduction of substances neither tubercular nor cheesy, such as simple catarrhal sputa, or even bits of paper, charpie or India rubber. Among those who obtained these results were such trained observers as Burdon Sanderson—*Report on the communicability of tubercle by inoculation*, Tenth Report of the Medical Officer of the Privy Council for 1867, Appendix, p. 111; see, also, abstracts in the Trans. of the Path. Soc. of London, Vol. XIX, 1867-8, p. 456, and the British Medical Journal, Vol. I, for 1868, p. 388; Wilson Fox—*A lecture on the artificial production of tubercle in the lower animals*, same Volume, p. 499 *et seq.*, also The Lancet, Vol. I, for 1868, p. 649 *et seq.*; Cohnheim u. Fränkel—*Exp. Untersuch. über die Uebertragbarkeit der Tuberkulose auf Thiere*, Virchow's Archiv, Bd. XLV, 1869, S. 216; and Waldenburg—S. 403 *et seq.*, *op. cit.*, p. 575, *supra*. At a subsequent stage of the discussion several skilful histologists denied that the lesions obtained in these experiments were really tubercles, regarding them as local inflammatory nodules, and the whole process as allied rather to pyæmia than to tuberculosis. This opinion, boldly formulated by Friedländer—S. 530 *et seq.*, *op. cit.*, p. 590, *supra*—was more or less completely shared by Hering—S. 57, *op. cit.*, p. 591, *supra*—and Max Wolff—S. 254, *op. cit.*, p. 588, *supra*. Nor has the opinion, supported by Gerlach, Bollinger, Klebs and others, that tubercle can be communicated from one individual to another by the food, especially by the milk and flesh of tubercular animals, escaped similar contradictions. I may particularly refer to the negative results of the experiments of Roloff, Möller—Jahresbericht, Virchow u. Hirsch, Jahrg. IX, 1874, Bd. I, S. 709 *et seq.*—and Schreiber—*op. cit.*, Jahrg. X, 1875, S. 289. I shall express no views as to the merits of the controversy on this subject, but may remark that so plausibly has the affirmative view been urged, that in June, 1875, the *Deutsche Gesellschaft für öffentliche Gesundheitspflege* adopted a resolution declaring it to be their opinion "that the results of the inoculating and feeding-experiments with the flesh and milk of animals affected with tubercle justify the assumption of a danger of infection to man, and therefore merit the greatest consideration by the sanitary police." Berliner Klin. Wochenschrift, Jahrg. XII, 1875, S. 550. I refer the reader who desires to pursue the study of the questions referred to in this note to the work of Waldenburg—cited *supra*—for the literature prior to 1869, and, for the titles of subsequent memoirs, to the Jahresberichte of Virchow and Hirsch. A very readable review, presenting the subject as it appeared to many minds in 1874, has been published by George Fleming—*The transmissibility of Tuberculosis*, The British and Foreign Med.-Chir. Review, Vol. LIV, 1874, p. 461.

manners; yet it seems to suggest a convenient method of grouping the individual causes and will serve to keep their modes of action prominently in view.

FAULTY ALIMENTATION.—Among the causes which act directly upon the intestinal mucous membrane I shall first discuss the various unhealthy alimentary conditions, which unquestionably play a considerable part in the production of the intestinal fluxes; and here the various forms of improper *drink* are to be considered, as well as unsuitable, insufficient or badly cooked *food*.

BAD DRINKING WATER.—Impurities in the water used for drinking purposes have been reckoned among the causes of disease from the earliest times. We have already seen that Hippocrates,* who discussed this question at some length, attributed the diarrhœas and dysenteries, as well as the agues, of those who dwell in marshy districts to drinking the stagnant waters of lakes and ponds. This opinion was accepted by Galen,† in whose writings, also, two notable passages occur in which he affirms disease to have been produced in camps and armies by bad drinking water. According to Galen, the best water for drinking purposes is that which is devoid of any noticeable quality either to the sight, the taste or the smell; muddy waters should be clarified by filtration through porous earthenware vessels, the more subtly poisonous waters of marshes and stagnant ponds should be purified by boiling. The Arabian physicians also embraced, without questioning, the Hippocratic opinion that dysentery may be produced by drinking stagnant waters, as may be seen, for instance, in the Canon of Avicenna,‡ in which the observations of Hippocrates

* See note [, p. 398, *supra*. In the treatise on *Airs, Waters and Places, loc. cit.*, HIPPOCRATES treats quite fully of the various kinds of unwholesome drinking water and of the diseases supposed to arise from their use.

† GALEN—*Comm. III in Hippoc. de Humoribus Lib.*, § 20, [Ed. Kühn, XVI, p. 436]—cites with approval many passages from the Hippocratic treatise mentioned in the last note, among others that referring to the production of diarrhœas and dysenteries by drinking the stagnant waters of lakes and marshes. The two passages relating to army diseases produced by bad drinking waters, to which I have referred in the text, are the following: "Potest interdum quoque prave aquæ potus morbum omnibus communem efficere idque in castris evenisse memoriæ proditum est, quemodo et ob loci naturam, ubi omnes eodem loco castra metati permanserunt," *Comm. I in Hippoc. Epidem. I, Præfatio*, [Ed. Kühn, XVII, A, p. 9;] and again in another passage, after speaking of diseases resulting from eating semiputrid wheat, he adds: "Sed et exercitus quandoque dum pravis uterentur aquis, simili in omnibus militibus noxa vexatus est," *Comm. II in Hippoc. de Nat. Hom. Lib.*, § 3, [Ed. Kühn, XV, p. 119.] In neither of these passages does GALEN specify what the disease "common to all" the soldiers was. I have no doubt, however, that he meant camp dysentery, which had long before acquired the evil reputation of being *the* camp disease, which it has never since lost. Thus in the *Theætetus* of PLATO—*Opera Omnia*, Tauchnitz Ed., Leipsic, 1867, T. I, p. 193; also Cary's translation in Bohn's Classical Library, London, 1870, Vol. I, p. 369—*Euclides* says of his friend *Theætetus*, just brought back to Athens from the army then besieging Corinth: "He is in a bad state from several wounds, though he suffers more from the disease that is prevalent in the army." On which *Terpsion* asks: "Is it dysentery?" *Euclides*. "Yes." With regard to the purity of water GALEN says: "Judicantur autem hæ tribus sensibus, nempe gustu, visu et odoratu. Gustu pura est, si nullam offerat qualitatem, sed ad unguem qualitatis expers appareat; visu pura est, quum sincera fuerit ac plane perlucida. Sic nec odoratu ullam præ se ferre qualitatem debet," &c., *De Simpl. Med.*, Lib. I, Cap. 5, [Ed. Kühn, XI, 390;] compare *De Sanitate Tuenda*, Lib. I, Cap. 11, [Ed. Kühn, VI, 56.] The advice to filter muddy water, *e. g.*, that of the Nile, before drinking it, will be found in the treatise *De Simpl. Med.*, Lib. I, Cap. 4, [Ed. Kühn, XI, 389;] he advises that it should be percolated through porous clay vessels, and that if one filtration does not remove all the impurities the process should be repeated several times. Elsewhere GALEN mentions—*Comm. IV in Hippoc. Epidem.* VI, Sect. IV, § 10, [Ed. Kühn, XVII, B, p. 155]—that he had seen water exposed in porous clay vessels for the purpose of cooling it, both in Alexandria and throughout all Egypt; so that the practice of filtration, also, is probably of Egyptian origin. The advice to boil the water of marshy pools before drinking it will be found in *Comm. III in Hippoc. de Humoribus Lib.*, § 3, [Ed. Kühn, XVI, p. 362,] he explains that after boiling the impurities promptly settle, and the supernatant clear water can be decanted and drunk with impunity. GALEN mentions further that the quality of water may be modified by herbs growing in it or metals dissolved by it. The former may produce either beneficial or injurious effects, according to the nature of the herbs; the latter are always injurious, *loc. cit.* As a striking example of the bad effect of such waters, he elsewhere particularly specifies water which has been carried in leaden pipes; such waters contain poisonous matters dissolved from the lead, and those who drink them become dysenteries: "Quæ per plumbeos canales derivatur, fugienda erit; limus enim quidam ex plumbo in ea continetur. Unde etiam qui aquæ ejusmodi faecem combibunt dysenterici evadunt," *De Compos. Med. Secundum Locos*, Lib. VII, Cap. 2, [Ed. Kühn, XIII, p. 45.] This passage will serve to illustrate in how broad a sense the word dysentery was sometimes used by the Greek physicians, who, at times, designated by it almost any painful affection of the intestines.

‡ AVICENNA—*Canon*, Venetiis, 1595, apud Juntas, Lib. I, Fen 2, Doctr. 2, p. 114, Cap. 16, De dispositionibus aquarum. See, with regard to the production of dysentery by drinking stagnant waters, p. 116. With regard to the modes of purifying water mentioned in the text, see Lib. I, Fen 4, Doctr. 5, Cap. 7, De conservando iter agentem a nocumentis aquarum diversarum, p. 194. After mentioning filtration and boiling, I find the following passage: "Et majus hoc toto est, ipsam sublimando distillare. Est etiam, quum ex luna retorta fit lychinium, cujus una extremitas in vas plenum ponitur altera in vas vacuum: et guttatim aqua ad vacuum dilabitur." I am a little at a loss to interpret the first sentence, but suppose the second to show its meaning. The annotators add to this chapter, after stating that it sets forth several modes of purifying water: "Sublimationem addit eam, quæ dissolutis per filtrum dicitur inventum Arabum." AVICENNA further recommends that bitter and bad waters be boiled, that while boiling some clay be thrown in now and then to use the twisted wool as above directed. He commends also the admixture of wine to remove the bad qualities of water and admixtures of vinegar, etc. Alum (alumen jameni) he particularly recommends for turbid waters. The alum method is still in use; see PARKES—*Manual of Practical Hygiene*, 4th Ed., London, 1873, p. 27—as to its modern employment. Compare RHAZES—*Ad Mansor. de Re Med.*, Lib. III, Cap. IV, in *Opera*, Basl, 1544, p. 58—"Turbida autem aqua, in hepate oppilationem, et in renibus lapidem generat. Salsa etiam aqua, prius ventrem solvit, postea vero stringit, si quis eam consuete biberit, corpusque desiccat, in quo scabiem atque rhagadias generat. Aqua vero stans et putrida, splenem augmentat, ac complexionem corrumpit et generat febres."

and Galen with regard to drinking waters of various kinds, and their real or supposed morbific influences, are repeated at length, with, however, some important additions to the methods of purifying bad water. Besides purification by filtration and boiling, we read here of the use of a wick of twisted wool, one end of which is to be introduced into a vessel full of water, while the other end hangs over into an empty vessel, into which the purified water will fall drop by drop. So also we find mention made of the use of alum to purify water, and of the admixture of wine for the same purpose.

These references will serve to show that the attention of the medical profession has been critically directed from the earliest times to the real or supposed influence of bad drinking water in the production of disease, but it is only within comparatively modern times that the methods available for the chemical examination of waters have reached such a degree of approximate accuracy as to elevate inquiries of this class to the dignity of scientific investigations. I shall not attempt in this place to give an account of the various expressions of opinion on this subject, which can be found in medical literature from the time of the invention of printing to the commencement of the present century. These opinions were usually mere repetitions of the utterances of Hippocrates and Galen, or vague generalizations such as Sennertus* uses when he enumerates too abundant or vicious food and drink among the external causes of diarrhœa. Even the army surgeons, prior to the present century, for the most part laid but little stress on bad water as a cause of intestinal fluxes, or denied its influence in toto; Sir John Pringle and Donald Monro have been erroneously referred to as believing bad water to be a cause of dysentery.† Any detailed examination of the modern literature of this subject is precluded by the great space which it would necessarily occupy, and I must, therefore, limit myself to a very brief presentation of the evidence which at the present time is regarded as connecting certain impurities of potable waters with the production of intestinal fluxes. The impurities to which this effect has been assigned may be of inorganic, vegetable or animal origin, and may be merely suspended or actually dissolved in the fluid. A particular water may be rendered unwholesome by the excess of any one of these impurities, or several of them may coexist.

*Inorganic substances in suspension.*—The water of certain streams, as, for example, that of various great rivers, is often turbid with mud, clay or other undissolved inorganic impurities; and this is especially the case during the floods which follow heavy rains, or the melting of snow in the highlands and mountains of the water-shed during the spring of the year. The use of such water, which was supposed by the Greek physicians‡ to produce kidney disease and stone in the bladder, has of late been accused of causing intestinal

* Sennertus—*Pract. Med.*, Lib. III, Pars 2, Sect. 2, Cap. 6, Opera, Paris, 1641, T. III, p. 115: "Cibus et potus copiosus vel vitiosus."

† Thus, for example, Parkes—*Manual of Practical Hygiene*, 4th Ed., London, 1873, p. 41—remarks: "Dysentery also is decidedly produced by impure water, and this cause ranks high in the etiology of dysentery, though perhaps it is not the first. Several of the older army surgeons refer to this cause. Pringle does so several times, and Donald Monro in the campaigns in Flanders and Germany." I could well wish that this passage had been accompanied with references to the places cited, especially as both the writers named appear to me to have exercised extreme caution in their expressions of opinion on this subject. Sir John Pringle—*Obs. on the Diseases of the Army*, 7th Ed., London, 1774, p. 91—remarks that the water commonly used by the English army in Flanders was "plentiful and good. The only exception worth notice was in Zealand, where the water being indeed less pure, it might concur with other causes in making the sickness more general in that province. But in most other places our water was blameless, and particularly in the two seasons during which the bloody-flux was most epidemic. To conclude, whoever will give attention to the account of the several campaigns, will see such an uniformity in the rise and periods of the diseases, and that so much connected with the state of the air, as will be sufficient to convince him, that neither the abuse of spirits, nor of fruit, nor drinking bad water, could have any considerable share in producing them." Indeed, when he treats particularly "of the causes of the dysentery," Part III, Cap. VI, p. 251, he does not so much as mention the drinking water. Nor do I find that any such views as Parkes has attributed to him were expressed by Donald Monro—*Account of the diseases which were most frequent in the British Military Hospitals in Germany*, &c., London, 1764, p. 57; also, *Obs. on the Means of preserving the Health of Soldiers*, &c., London, 1780, Vol. I, p. 314—who does not even so much as mention bad water in his account of the causes of dysentery, which he attributed to the effect of moist putrid vapors, or to "an obstructed perspiration joined to a putrescent acrimony of the blood, or of the bile or other gastric liquors arising from heat and motion."

‡ See, for example, Hippocrates, *op. cit.*, in note *, p. 599, *supra*, and Galen—*Comm. III in Hippoc. de Humor. Lib.*, § 20, [Ed. Kühn, XVI, p. 138.] They also attributed hip joint disease and even hernia to the same cause.

fluxes. The opinion expressed by Wm. A. Hammond,* that the waters of the Mississippi, the Missouri, the Kansas and the Rio Grande produce diarrhœa in those who drink them, particularly if unaccustomed to their use, has been brought forward by Parkes, and after him by Roth and Lex,† as testimony in favor of this view. We learn from Chapman‡ that it was popularly believed in 1836 that the use of the water of the Mississippi for drinking purposes produced diarrhœa; and I occasionally hear the same opinion expressed verbally at the present time. Those said to have been affected are generally strangers, who, shortly after arriving at Cincinnati, St. Louis, New Orleans or some other western city, are attacked with diarrhœa, which forthwith, without further evidence, they ascribe to the drinking water of the place.

The sagacious Drake§ has recorded his testimony in the most unqualified manner against this view. He declares that even in the case of the turbid waters of the Missouri, and of the Mississippi below the point of its influx, the testimony of the population on its banks, and of the boatmen who ply their craft on the stream, is unequivocally favorable to its use, and that its salubrity cannot be regarded as an open question. This testimony of Drake, based upon the laborious inquiries instituted by that faithful observer among the physicians of the villages and towns that dot our western waters, is not contradicted by any statistical facts with which I am acquainted. The chart illustrating the geographical distribution of the mortality from diarrhœa, dysentery and enteritis, according to the census of 1870, to which I have already referred,‖ shows no relationship between the mortality from these diseases and the water-courses. Nor do I find, according to the census reports for the same year, or those for 1860 and 1850, that the states which border on the Mississippi, the Missouri or the Kansas have, as a rule, any greater mortality from diarrhœa or dysentery than other states.¶ I have vainly examined the reports of the

* W. A. HAMMOND—*A Treatise on Hygiene*, Philadelphia, 1863, p. 218: "The earthy matters which are so abundant in some of our western river waters almost invariably cause diarrhœa in those who are unaccustomed to their use, though this effect gradually ceases to be produced if the drinking of the water is persisted in. I have very frequently known the water of the Mississippi, the Missouri, the Kansas, and the Rio Grande give rise to severe diarrhœa, continuing for several weeks, and occasionally terminating in ulceration and death. Even in persons who can at ordinary times drink the water of these rivers with impunity, frequent intestinal discharges are produced when floods have caused an increased quantity of earthy matters to be held in suspension." This opinion, which is merely expressed *ex cathedra*, without bringing forward any evidence in its support, I suppose to have been based upon the occurrence of diarrhœa among soldiers at military posts, on the streams in question, of which the writer was post surgeon. But in such cases a variety of other causes may have been more influential in determining the result.

† E. A. PARKES—p. 38, *op. cit.*, note ‡, p. 599, *supra*. W. ROTH und R. LEX—*Handb. der Militär-Gesundheitspflege*, Bd. I, Berlin, 1872, S. 23. According to the preface, this work was originally commenced as a translation of the 3d edition of the *Hygiene* of PARKES, but subsequently much enlarged.

‡ N. CHAPMAN—*Loc. cit.*, note **, p. 401, *supra*.

§ DANIEL DRAKE—*Principal Diseases of the Interior Valley of North America*, Cincinnati, 1850, p. 72: "The salubrity of the Mississippi water, or that of the Missouri, which imparts the character of turbidness, is not an open question. From St. Louis to New Orleans, the testimony of the population on its banks, and of those who spend a great part of their lives upon it as watermen, is unequivocally in its favor. Many persons drink it before its suspended materials have subsided, and seem to prefer it to that which has been rendered transparent by time or art. That it produces some effects on the system, which transparent water, from wells and springs, and our other rivers, does not, is an established popular opinion. It is even regarded by many persons as being, to a certain extent, medicinal, and especially adapted to the cure of chronic functional disorders of the stomach, bowels, and liver—an opinion in which I am disposed to concur. That its daily use averts some forms of disease, may be admitted as probable; but precise observations on all these points are wanting." Elsewhere, in the same work, DRAKE testifies (p. 662) that "in most of the larger towns and cities" of the great interior valley of the United States, as Pittsburgh, Detroit, Cincinnati, St. Louis and New Orleans, the people drink river water. It stands in reservoirs, exposed to the air and sun, "until it has deposited a part of the earthy matters suspended in it; but, in floods, when the quantity is great, it is sometimes distributed and drunk while it is yet turbid. Besides the matters thus suspended, but heavy enough to be deposited, there are traces of muriate of soda, and carbonate and sulphate of lime, in solution; and, from the vast amount of dead vegetables and animals on their banks, it can scarcely be doubted that they contain, in suspension, or solution, or both, a minute quantity of organic matter. Still, while some constitutions may never become reconciled to the use of river water, I am not in possession of facts to show that it produces or averts any serious disease. The water in St. Clair, Detroit, Niagara, and St. Lawrence Rivers, is strictly that of the lakes, and approaches nearer to the character of rain water than that of our rivers. The water of the Missouri and lower Mississippi, again differs, as we have seen, from that of the upper Mississippi, of the Ohio, and of their tributaries, in the great amount of suspended materials. Notwithstanding, but rather in consequence, it is universally regarded as salubrious, and even, by many persons, alterative and medicinal; especially in chronic ailments of the abdominal viscera. To produce any effects of this kind, it should, no doubt, be drunk immediately from the river, and before it has undergone clarification by deposition, or by any artificial process." This testimony is supported by the opinion expressed by BENNET DOWLER—*Psychological and hygienic observations and reflections on rivers*, The New Orleans Med. and Surg. Jour., Vol. XVIII, 1861 p. 56—that "the expensive chemical processes, which, by the way, are of dubious salubrity, now practised for the deodorization of rivers, the Thames, for example, is not required for the sweet, odorless, and potable waters of the lower Mississippi."

‖ See p. 419, *supra*.

¶ See note * to p. 420, *supra*.

boards of health of the cities of St. Louis and New Orleans.* whose water supply is derived from the turbid Mississippi, for opinions unfavorable to the use of this water for drinking purposes, or for facts in any way indicating that it produces intestinal fluxes. I find in the reports from both cities earnest protests against the use of the impure water of wells dug within the city limits, but no voice raised against the river water. Nor is there any apparent connection between the spring floods, with the resulting increase in the turbidity of the river, and the monthly fluctuations in the mortality of the intestinal fluxes or of the number of cases treated at the city expense, so far as can be ascertained by the statistical tables contained in these reports. So, too, I have vainly examined the official publications of the medical department of the United States Army, edited by Forry, Coolidge and Billings,† for expressions of opinion with regard to any injurious effects from drinking the waters of muddy rivers, though several medical officers in their reports contained in those works give instances in which the dissolved impurities in the waters of certain rivers, springs and wells are supposed to have caused diarrhœa.

Parkes makes a statement with regard to the water of the Ganges similar to that just discussed in connection with American rivers, but cites no authority for his opinion, which is contrary to the officially reported testimony of Medical Inspector General James Anderson and the observations recorded by Stewart Clark.‡ The same writer cites two interesting statements in support of the view that drinking water turbid with suspended mineral matters produces intestinal fluxes. One is the old observation of Lempriere,§ that the bowel complaints in Jamaica increased after the spring floods, when the water contained "a

* I have examined for this purpose the reports from each city for nine years, viz: *First Annual Report of the Board of Health of the City of St. Louis* for the year ending Dec. 31, 1867; 2d ditto, for 1868; 3d ditto, for 1869; 4th ditto, for 1870; 5th ditto, for 1871; 6th ditto, for 1872; 7th ditto, for 1873; 8th ditto, for 1874; 9th ditto, for 1875; *Annual Reports of the Board of Health to the legislature of the State of Louisiana* for 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874 and 1875. I note that J. W. CLEMENS, in the 2d St. Louis Report, p. 30, expresses the opinion that, "strange as it may seem," the mud of the Mississippi river "acts in an efficient manner as a purifying agent, so that the settled water is really purer than if it had previously contained no mud." He thinks the use of the "unsettled or unfiltered" Mississippi water "unadvisable," but makes no suggestion with regard to the nature of the injurious effects, if any, likely to result therefrom. In the Louisiana Report for 1873, p. 17, after a comparison of the impurities of the Mississippi water at New Orleans, as ascertained by analysis, with those of the Hooghly at Calcutta, as officially reported, I find the following passage: "The Mississippi water, unfiltered, is much purer and safer to drink than the filtered water of the Calcutta river, for the average amount of animal matter, [meaning the albuminoid ammonia as determined by Nessler's test,] which is the worst impurity in drinking water, is much less. The suspended matter, clay and mud, is far greater in amount, but is not particularly unwholesome."

† FORRY and COOLIDGE, cited on p. 416, *supra*. The report edited by Surgeon J. S. BILLINGS, U. S. A., to which I refer, is *Circular No.* 8, War Department, Surgeon General's Office, May 1, 1875. *A Report on the Hygiene of the United States Army, with descriptions of military posts*, Washington, 1875. I note that in the first statistical report of COOLIDGE, p. 364, Assistant Surgeon G. E. COOPER expresses the opinion that the diarrhœa occurring at Fort Duncan is "probably attributable to the saline waters of the Rio Grande," attaching the supposed injurious effect to the dissolved rather than to the suspended mineral matters of the stream. In *Circular No.* 8, p 296, Assistant Surgeon S. S. JESSOP, U. S A., reports from Fort Selden, New Mexico, which is supplied with drinking water from the Rio Grande: "I may observe that all cases of chronic diarrhœa appear to do badly at this post, and that, with my present convictions, I would not suffer, if it could be avoided, a patient laboring under this disease to remain at Fort Selden, or any point where the Rio Grande constituted the water-supply." Here the water is blamed without specifying which of its ingredients is supposed to be at fault. But I must point out that the consolidated sick report from Fort Selden for four years prior to June 30, 1874, published on the page opposite to this remark, does not indicate any greater proportion of diarrhœa and dysentery at that station than is shown in the same volume to have existed during the same time at many of the posts whose water supply has never been accused. Indeed, I may add that during the four years represented in this volume the average proportion of cases of diarrhœa and dysentery to strength at the posts on the Rio Grande is less than that which existed during the same period at David's Island, Fort Columbus, or Fort Hamilton, New York harbor, or even at Fort Ontario, New York.

‡ See PARKES—p. 38, *op. cit.*, p. 599, *supra*. Now Deputy Inspector-General JAMES ANDERSON—*Royal Commission on the Sanitary State of the Army in India*, Vol. II, Appendix; Answers, Fort William, Calcutta, p. 11—affirms that the water of the Hooghly river from off Fort Point "is soft, and its quality good, and not injurious to health." He admits that the river water is "unsuitable for six weeks annually" from its muddiness, but does not attribute any disease to its use. STEWART CLARK (Inspector-General of Prisons, Northwest Provinces, India)—*Practical Observations on the Hygiene of the Army in India*, London, 1864, p. 78—in speaking of the water of the Hooghly at Calcutta, declares that "we have no positive proof that the water is injurious to health to the extent some authorities would wish us to believe. Were it so, few of the ships which arrive at Calcutta would ever leave it again; for nine-tenths of the crews would be poisoned by the water." He goes on to show the general use of this water, often unfiltered, by the shipping at all times, and points out the imperfect character of the method of filtration usually resorted to; after which he relates that he had four times accompanied detachments of European invalids from Calcutta to England, and found that even in the case of chronic bowel complaints the cause of anxiety diminished the longer the ship was at sea, although the patients were still drinking the Ganges water with which the ship's tanks were filled.

§ WM. LEMPRIERE—*Pract. Obs. on the Dis. of the Army in Jamaica*, London, 1799, Vol. I, p. 25—after mentioning the increase of fluxes in May, after the floods, adds: "Much pains were taken by myself, and other medical gentlemen, to ascertain what share this water might have in the production of bowel complaints: on this account the commanding officer of the regiment to which I was surgeon (at my recommendation) purchased drip stones, for the purpose of affording the men an opportunity of using pure water for their common drink. Upon trial, we did not find any material difference in the number of cases that came under our care, so that we naturally attributed the principal cause of the disease to arise from a damp atmosphere." He also remarks that after the rains the air became hot, oppressive, and induced general relaxation.

quantity of filth and dirt, forced down by the heavy rains," but it must not be forgotten that Lempriere himself submitted the speculation, in support of which his views are now cited, to the test of experiment; he filtered the turbid water supplied to the men, and found that no diminution in the number of cases of bowel complaints resulted, whence he wisely concluded that they must have some other cause. The other is the ingenious report of Whitwell,* who imagined the hill diarrhœa of Dhurmsala to be produced by very fine scales of mica, suspended in the drinking water, which acted as irritants to the intestinal mucous membrane. A perusal of his report, however, leads me to regard the evidence adduced in favor of this conjecture as inconclusive; nor do I find any other testimony in its favor, or indeed any in favor of the opinion that fluxes ever result from the use of muddy drinking water, in the elaborate official reports on water analysis in Bengal,† in one of which Whitwell's essay was published.

The inorganic matters in suspension in the waters of great rivers, when turbid with mud, are for the most part quite insoluble, and can only be supposed to produce fluxes in consequence of mechanically irritating the intestinal mucous membrane. If this were the effect of the ingestion of such substances, the experimental administration of similar quantities of clay and mud ought to produce similar results. This experiment was tried by Grellois,‡ who, for fifteen days, swallowed daily two grammes of earthy matter taken from the banks of a stream, but without any appreciable effect upon his health.

On the whole, then, notwithstanding the opinions to the contrary which have been expressed in certain quarters,§ I have been led by my examination of this subject to the conclusion that the injurious effects of suspended inorganic matters in drinking water have been grossly exaggerated, if, indeed, they are not altogether imaginary. Of course muddy water may also contain other impurities of such a character that it may unmistakably cause fluxes in those who drink it. But in most of the instances in which the turbidity

* Assistant Surgeon H. WHITWELL—*Second Report on the Water-Supply of Dhurmsala*, in the Eighth Report of the Analysis of Potable Waters of Cantonments in the Bengal Presidency, by F. N. Macnamara, Calcutta, 1871. p. 43—arrived at the conclusion that the diarrhœa which prevails at Dhurmsala "is due to the minute scales of silica and mica, which accumulating in the vicinity of the rocks from which the springs emerge, formed by the action of the atmosphere on the rocks leading to a slow disintegration, become washed down in the different water-courses, and being swallowed set up by mechanical irritation, the peculiar symptoms of hill diarrhœa." He shows that when this water is boiled the mica scales are "entangled in the other foreign matters present" and precipitated, and recommends that the drinking water of the station be thus treated as a prophylactic measure. He states, in support of this view, that "in two cases of obstinate diarrhœa, which all previous treatment had failed to benefit, a perfect cure followed the continued use of boiled water, a relapse following immediately the water was not boiled;" that in the case of a particular family, "a perfect immunity from the disease has been obtained by a rigid adherence to boiled water;" and that he himself "obtained perfect and speedy relief by boiling the water" he used, and "when puzzled one day by a relapse, apparently without cause," ascertained that he had been supplied with unboiled water. Now evidence of this character would certainly sustain his position, if there was enough of it, but the experience of three patients and one family will hardly settle a question of this kind. When, in further support of this speculation, he points out that those of the inhabitants of the station whose drinking water contained most organic matter suffered least from the diarrhœa, he proves only that the organic matter of the drinking water cannot be charged with causing the diarrhœa of this station; but the argument which he places foremost, and on which he appears chiefly to rely in support of his view, appears to me a striking example of the *non sequitur*: "Every circumstance connected with the disease would serve to show that it is one due to mechanical irritation; commencing as diarrhœa it speedily proceeds, if not arrested, to dysentery and death, and it is confessed that the usual remedies employed in diarrhœa and dysentery produce no effect whatever on this variety. The post-mortem examination of those who die of the disease also supports it, for almost invariably congestion and ulceration of the mucous membrane of the intestines were to be observed, and these appearances were also noted in those dying from fever with great biliary derangement.' This description, which would be of equal accuracy and force if applied to the diarrhœa of Cochin China, in support of the speculation of NORMAND that it is caused by an anguillula, [see p. 372, *supra*,] might be repeated wherever chronic fluxes prevail, even at stations where mica scales in the water are quite out of the question.

† I have examined for this purpose both the *Reports on the Water Analysis in Bengal*, from 1857 to 1871, and the *Answers* to the questions propounded by the *Royal Commission on the Sanitary State of the Army in India*, Vol. II, Appendix. I may mention, however, in this connection, the statement made by BARRALLIER—Art. *Dysenterie*, Nouv. Dict. de Méd. et de Chir. Pratiques, T. XI. Paris, 1869. p. 723—on the authority of an unedited note by C. SENELLE, that the marines occupying barracks in the quartier d'Orléans (La Basse-Terre, Guadeloupe) were formerly supplied with water from the river Dugommier by means of a canal which commenced some distance up the mountain in order to secure its purity. The water, however, contained a good deal of inorganic matter, ("une grande quantité de résidus salins.") These men suffered frequently from severe dysentery until cisterns were formed and rain water supplied, after which the disease almost entirely disappeared, and the few cases which occurred were no longer as grave as formerly. Unfortunately we have the testimony of Dutroulau that a similar experiment tried at St. Pierre (also in the French Antilles) was quite unsuccessful, p. 564, *op. cit.*, note ‡, p. 551, *supra*.

‡ GRELLOIS—*Études hygiéniques sur les eaux potables*. Rec. de Mém. de Méd. de Chir. et de Pharm. Militaires, T. II, 1870, p. 134.

§ See, besides the authorities already cited in favor of the supposed injurious effects of muddy drinking water the work of C. KIRCHNER—*Lehrb. der Militär-Hygieine*, Erlangen, 1869, S. 101—and various other text-books which repeat the assertion as an established fact without appearing to think it at all necessary to adduce proofs in its support.

of the water has been blamed, I suspect that much more serious morbific influences coexisted and were the real causes of the disease. This appears to me to have happened during the civil war in the case of those fluxes which occurred among the troops on transports on the lower Mississippi. I have not unfrequently heard the opinion expressed in conversation that they were caused, in part at least, by drinking the turbid water of the river, and the same view is maintained in a few of the reports in Section II.* But I must believe that the evidence I have just presented vindicates the harmless character of the water of that stream, and that the fluxes which occurred among the troops on transports during the operations in question were due to the same causes that produced the equally numerous and fatal fluxes among their comrades in camp in various parts of the Central Region.

*Inorganic substances in solution.*—The evidence connecting certain inorganic impurities in solution with looseness of the bowels is of a much stronger character. The purgative effects of the waters of many mineral springs are well known, and on this account they have long been employed for remedial purposes; but the precise effect of the various ingredients of this class, which exist to a minor extent in all river and spring waters, and the precise quantities in which they first begin to act injuriously, are by no means so accurately ascertained as could be wished. A definite quantity of saline ingredients in the drinking water is probably desirable, if not indispensable, to the perfect health of the consumers, and where, as in the case of rain water or water collected by distillation, the supply is deficient in this respect, it has been proposed to add a small quantity of saline matter, especially bicarbonate of lime, before using it for drinking purposes. Our knowledge of this question is, however, by no means either positive or precise.†

The waters of many wells and springs and even of brooks and rivers contain in solution salts of the alkaline earths in such quantities as to interfere with the formation of a lather with soap when the water is used for washing. Such waters are familiarly known as hard, while those which readily make a lather with soap are spoken of as soft. Water which owes its hardness merely to an excess of carbonate of lime is not disagreeable to the taste, and on being boiled softens very much. Water, the hardness of which is communicated by its passage through strata of magnesian limestone, often contains sulphates as well as carbonates of lime and magnesium; it does not soften so much in boiling as the former variety, and is more or less disagreeable to the taste. Water charged with a considerable excess of sulphate of lime, sometimes spoken of as selenitic, softens very little on boiling, and is still more disagreeable to the taste.‡ Different effects may reasonably be expected

* See, for example, the reports of GAGE, p. 93, who, however, speaks of "the use of the impure Mississippi and surface waters;" BIDWELL, p. 96, according to whom "one probable cause of the prevailing diarrhœa is the use of unfiltered water of the Mississippi river;" and REECE, p. 97, who attributed the diarrhœa of the 118th Illinois, while on transports on the Yazoo, to drinking the water of that river.

† BOUSSINGAULT—*Recherches sur le développement de la substance minérale dans le système osseux du porc*, Comptes Rendus, T. XXII, 1846, p. 356—showed experimentally that some growing pigs assimilated more lime salts than were contained in the food given them, less that contained in their excretions, and that the surplus must have been contained in the water drank: "De ce qui précède il résulte la preuve de l'intervention des substances salines de l'eau dans l'alimentation qui, sans leur concours, aurait été insuffisante." E. J. A. GAUTIER—*Chimie appliquée a la Physiologie*, &c., Paris, 1874, T. I, p. 157 *et seq.*—has attempted to show that an adult workman excretes more than a gramme (1.247 grm.) of calcium oxide and a small quantity of silica (.061 grm.) more than is contained in his daily allowance of bread and meat, and that the excess must be obtained from such vegetables and wine as he may obtain and the water drank; he concludes that the latter, "being the only constant element in the alimentation should be such that its mineral elements can compensate for the continual losses of disassimilation." This writer accordingly advises that distilled water, such as is often used on board ship, should have added to every litre .2 to .3 grm. of bicarbonate of lime, .025 to .3 of sea salt and a trace of silicates, p. 176. On the other hand, HENRI BUIGNET—Art. *Eau*, Nouv. Dict. de Méd. et de Chir. Pratiques, T. XII, Paris, 1870, p. 206—declares that the evil effects of water containing no salts have been greatly exaggerated; and GRIMAUD (de Caux)—*Aménagement et conservation des eaux pluviales pour les besoins de l'économie domestique*, Annales d'Hygiène, T. XIV, 1860, p. 469—in advocating the use of rain water for drinking purposes, boldly declares that it is an error to insist that water intended for ordinary drinking purposes ought necessarily to contain certain salts in solution.

‡ PARKES—p. 23, *op. cit.*, p. 599, *supra*—speaks of waters of the first class as chalk waters; they may contain from 7 to 20 grains of calcium carbonate per gallon. The second he speaks of as limestone or magnesian limestone waters; they usually contain from 4 to 12 grains of calcium sulphate and less carbonate, in the dolomitic districts much magnesium sulphate and carbonate. The selenitic waters may contain 6 to 20 grains of calcium sulphate, or even more; this water is not good for cooking or washing.

to result from the use of waters containing these different kinds of impurities, and experience seems to indicate that, while the first kind is quite wholesome, the second not unfrequently disturbs the bowels of those especially who are unaccustomed to its use, and the third may even, especially in high degrees of impregnation, produce such active and persistent purgation as to render its continued use injurious.

In the United States we have the testimony of Drake that in the great limestone tract of the Central Region, including the eastern half of Indiana, the western part of Ohio, the central section of Kentucky and middle Tennessee, the water of both wells and springs is hard, chiefly in consequence of the amount of carbonate of lime it contains in solution. In different parts of the formation the quality of the water varies considerably, and its chemical composition in many districts is not definitely known. According to Drake the best water of the region issues from fissures or seams in the limestone rocks or is drawn from wells sunk in them. It is drunk by the people of the most populous parts of the valley of the Ohio river and its tributaries. He seems half inclined to attribute to its use the dyspepsia, which in his time was common in these districts, as indeed it was at the same time in almost all parts of the United States, yet was obliged to declare that the ample development and general good health of the people who drink this water demonstrate that it is a salubrious beverage.* There are, undoubtedly, many districts in the eastern United States, especially on the slopes of the Appalachian chain, where the limestone water contains enough of the earthy sulphates to act as a laxative upon new-comers, although the natives drink it with impunity; and there are many wells and springs which contain so much, especially of the sulphate of lime, as to be quite unfit for habitual drinking. Throughout many districts of the Appalachian region, also, mineral springs of the most various kinds abound, charged with iron, alum, sulphur, sulphates and other substances. Some of these waters are highly purgative.†

According to Parkes,‡ dyspeptic symptoms accompanied by constipation, with occasional diarrhœa, are produced by the use of drinking water "containing a large quantity of calcium sulphate and chloride, and the magnesian salts." He states that water containing more than 8 grains of each substance, individually or collectively, appears to be injurious to many persons, and mentions two instances of well water containing respectively 50 and 58 grains per gallon, which was found to disagree with so many persons that no one would use it. Pinel,§ long ago, accused the water of a well in the Salpêtrière hospital of giving rise to chronic diarrhœa among those who drank it, on account of the great quantity of sulphate of lime and other earthy salts it contained. A similar accusation was made by

* DRAKE—p. 663, *op. cit.*, p. 601, *supra*: "The best kind of hard water is that of springs which issue from the fissures and seams of limestone rocks, or is drawn from wells sunk in them. Such is the water drunk by the people of the most populous parts of the valley of the Ohio River and its tributaries. Their ample development and general good health demonstrate that it is a salubrious beverage. Nevertheless, there is much dyspepsia within the specified region, and calculous affections appear to prevail more than elsewhere. On the other hand, goitre occurs much less frequently than in sandstone, slate, and coal districts."

† The literature of the mineral waters of the United States may be said to be in its infancy. I will not attempt to refer here to the scattered papers on the subject, but may name the works of JOHN BELL—*On Baths and Mineral Waters*, Philadelphia, 1831; J. J. MOORMAN—*The Mineral Waters of the United States and Canada*, Baltimore, 1867; and G. E. WALTON—*The Mineral Springs of the United States and Canada*, New York, 1873—as containing a good deal of interesting information on this head. Further studies are, however, very much needed.

‡ PARKES—p. 38, *op. cit.*, p. 599, *supra*—declares that a much less degree than the 8 grains mentioned in the text will affect some persons. Of the wells mentioned, one at Chatham contained calcium carbonate 19 grs., calcium sulphate 11, sodium chloride 13, total solids 50 grains per gallon. The other well contained calcium carbonate 22 grs., calcium sulphate 11, sodium chloride 14, total solids 58 grains per gallon.

§ PH. PINEL—*La Médecine Clinique*, 3me Éd., Paris, 1815, p. viii *et seq.*—observed that the water of a well used by the inmates of the Salpêtrière hospital contained a large quantity of sulphate of lime and other salts, and regarded its use as favoring "a certain disposition to chronic diarrhœa which is so often observed in the hospital." The water, analyzed by his student SCHWILGUÉ, was found to contain, in fifty litres, sulphate of lime 57 grammes, carbonate of lime 23.55, carbonate of magnesia 10.73, muriate of lime 6.25, muriate of magnesia 4.02, nitrate of potassa 5.33, muriate of soda 2.10, total 108.98 grammes per 50 litres. He points out that while this water contained 1.14 grammes of sulphate of lime per litre, the water of the Seine only contains .0629 grammes per litre of this salt.

Parent-Duchatelet against the waters of a well in the prison of St. Lazare.* These opinions have been repeated by many subsequent writers, and the use of selenitic waters for drinking purposes is commonly asserted in the text-books to cause diarrhœa. That such water will often act as a purgative, especially when first used, is, I suppose, sufficiently well established, but I suspect that a very much larger quantity of saline matter, than is commonly believed, must be present in a water before its continued use will be likely to produce any injurious effect upon the bowels. I would point out that some of the mineral springs of the United States which are thronged every summer with visitors, who drink the waters freely for their real or supposed healing virtues, rival the well, made famous by Pinel, in the quantity of sulphate of lime they contain; and yet although at first their effect is often decidedly laxative, they are so far from producing troublesome fluxes among those who drink them for some time that they are often recommended as possessing remedial effects, not only in dyspepsia but even in chronic diarrhœa.†

During the civil war I not unfrequently heard the opinion expressed by medical officers that the hard water of certain camp sites, especially in the Shenandoah valley and in the Central Region, was to blame for the prevailing fluxes, and this belief is occasionally mentioned in the reports contained in Section II.‡ But, while I am still quite willing to admit that there may have been localities in which, on the first arrival of troops, the water produced a laxative effect on account of its saline impurities, I am no longer so much impressed as I was in 1863 § with the importance of this cause.

Still more prone to disturb the bowels than waters containing earthy salts in solution are those impregnated with the salts of soda and potash. Such waters are sometimes obtained from artesian wells, and may be quite undrinkable, or if less highly charged may yet be capable of producing a purgative effect. They occur also in the great alkaline plains of the western territories of the United States and many of the mountain springs and streams of the Rocky Mountain region, in which sulphate of soda is a widely diffused ingredient that often exists in considerable quantities. The use of such water, charged besides with sulphur, is referred to by Poncet || as possibly one of the causes of the diarrhœa

* PARENT-DUCHATELET—*Hygiène Publique*, Paris, 1836, T. I, p. 236, note—made a similar observation at the prison of St. Lazare. The sick list was large without apparent reason for it; the patients were for the most part suffering with chronic diarrhœa or diseases of similar character. The well water used for drinking purposes, like that of the well at la Salpêtrière, was found to contain "a very large proportion of sulphate of lime and other purgative salts." The observations of PARKES, on the two wells mentioned in note ‡, p. 605, are of a similar character.

† Thus, the water of the White Sulphur Springs of Virginia, one of the most popular summer resorts in that state, contains, according to the analysis of A. A. HAYES, of Boston, 67 + grains of sulphate of lime and 30 + of sulphate of magnesia, besides other salts, in 50,000 grains of the water. MOORMAN, p. 87, *op. cit.*, p. 605, *supra*. The use of this water is recommended by MOORMAN for the cure, among other diseases, of dyspepsia, *op. cit.*, p. 128, and chronic gastro-enteritis, p. 134. So, also, the water of the Yellow Springs, Montgomery county, Va., contains, according to the analysis of GILHAM—*op. cit.*, p. 346—65 + grains of sulphate of lime and 21 + of sulphate of magnesia per gallon, besides other salts; we are told that from seven to eight tumblerfuls of it taken at intervals will usually produce "a mild cathartic effect;" yet we are further told that it is decidedly tonic in its effects, and that it is much relied on in chronic diarrhœa by those who have had most experience in its use—*op. cit.*, p. 348. It would be easy to multiply examples of this kind. According to PARKES—p. 20, *op. cit.*, p. 599, *supra*—it was decided by the Sanitary Congress at Brussels in 1853 that good drinking water ought not to contain more than 0.5 grammes of solids per litre, (= 35 grains per gallon.) I quite agree with him that this statement is of little use, because some kinds of solid matters are more likely to be injurious than others; but I cannot so well agree with his opinion that water containing more than 8 grains of sulphate of lime is from that fact alone likely to be injurious—*op. cit.*, p. 38.

‡ For example, PERRY—p. 70, *supra*—reporting from a camp near Harper's Ferry, says that the use of the limestone water of that region by the 10th Maine regiment "caused at first slight diarrhœas" among the men. So, also, LEE—p. 72—reporting from the same vicinity, accuses the lime water of aggravating the intestinal fluxes and causing a great deal of colic. So, also, according to the report of Medical Director MCPARLIN—Appendix to Part I, p. 110: "As early as the 15th of July [1862] Surgeon Thomas Antisell, U. S. V., Medical Director of the Second Corps, had expressed to me his hope that the corps might remain some little time in this 'red sandstone region, until the effects of the residence in the limestone strata of the valley passed off—diarrhœa and irritability of the whole lower bowels, arising from the excessive hardness of the water, and slight impregnation with sulphuret of iron. The water at Warrenton is soft, which, combined with the abundance of acid wild fruits, have completely checked the complaint.'" The observations which I shall hereafter present in connection with the effects of fresh fruits and vegetables in diminishing the prevalence of fluxes among troops, lead me to believe that in this case the abundance of wild fruits was of greater service than the change of water.

§ See J. J. WOODWARD—*Outlines of the Chief Camp Diseases*, &c., Philadelphia, 1863, pp. 210–11.

|| PONCET—*Des maladies qui ont régné dans le corps expéditionnaire du Mexique*, Recueil de Mém. de Méd., de Chir. et de Pharm. Militaires, T. IX, 1863, p. 218—relates that during the early days of the occupation of Orizaba a form of acute diarrhœa resembling cholerine prevailed. Cases also occurred in which the diarrhœa was moderate; the patients had but two or three stools a day, generally retained their appetite, and but rarely had gastric embarrassment, except just after meals, when the stomach and belly became enormously distended with gas which was sometimes odorless, at

which occurred among the French troops at Orizaba, Mexico, in the year 1862. According to the opinion of Surgeon E. P. Vollum, U. S. Army, the use of alkaline drinking water is one of the causes of the mortality of children, at Salt Lake City, from bowel complaints,* and in a report by Assistant Surgeon J. H. Patzki, U. S. Army, it is suggested that one cause of diarrhœa at Fort Fetterman, Wyoming Territory, may be the use, for drinking purposes, of the alkaline waters of the North Platte river.† Dr. A. C. Peale, of the U. S. geological and geographical survey of the territories, has obligingly given me a memorandum, which I append in the foot note,‡ relating to some of the experiences of the field parties of the survey as to the effects of drinking alkaline waters in Colorado, New Mexico and Utah. Active purgation was produced in a number of instances, lasting in some of those affected only a few days, in others more than a week. I call attention particularly to the statement that, although the well water along the Rio Puerco, in New Mexico, is so strongly alkaline that whenever used by the traveller (Mr. Jackson) it produced diarrhœa, the inhabitants of the valley are not affected by it; an observation which corresponds to what is noticed in the case of hard waters. The actual effect upon the health of the persistent use of alkaline waters and the degree of impregnation which could be tolerated are subjects which afford an ample field for future scientific observation.

other times had the smell of sulphuretted hydrogen, ("d'acide sulfurique," probably a misprint for sulfhydrique.) This symptom occurred, no matter what the food or drink of the patient might be, ("quel que fût l'aliment ou la boisson.") PARKES—p. 39, *op. cit.*, p. 599, *supra*—has cited this narrative as a proof that "water containing much sulphuretted hydrogen will give rise to diarrhœa, especially if organic matter be also present," and states that the affection described "was traced to the use of water from sulphurous and alkaline springs: even the best waters of Orizaba contained organic matter and ammonia in some quantity." This presentation of the case, however, is not exactly correct. POUCET expressly declares his ignorance of the true cause of the trouble: "Nous ignorons la véritable cause de ces hypersécrétions." He suggests two possible causes: 1st, The mode of nourishment, especially the fact that the French continued their custom of taking but two meals a day, while the natives have long since learned to eat more frequently and less at a time. 2d, The nature of the waters. The springs at the village of Ingénio, situated to the west of Orizaba, are sulphurous and highly alkaline, "sources sulfureuses alcalisées à un haut degré," and the troops camped here furnished the first patients. With regard to the waters of Orizaba, our author remarks: "Les eaux d'Orizaba, les meilleures même, en contiennent peut-être une quantité suffisante pour produire quelques désordres intestinaux sur l'armée, et inactive pour les habitants qui la boivent journellement; elles renferment, à coup sûr, des matières organiques et de l'ammoniaque en assez grande quantité." Suggestions of this kind must not be too lightly assumed to be established facts.

* Page 341, Circular No. 8, cited p. 602, *supra*.

† *Op. cit.*, p. 351. He reports that this water is impure and somewhat alkaline: "There is no doubt that large amounts of the sulphates are dissolved. Tests for magnesia exhibit quite a quantity of that substance in the water, though the combination is undetermined. Iron is exhibited in large amount. Sulphur is shown to be present, not only by tests, but also by taste and odor. The organic impurities are not of much amount. Sulphate of soda, which is a very constant impurity in the waters of this section, exists also in the waters of the Platte. Of course, its flavor to one unaccustomed to it is disagreeable; but its influence upon the health of the garrison is not very marked. During 1873, 49 cases of acute diurrhœa and dysentery appeared on the reports, or about 11 per cent. of all cases taken sick. The fact that the season of greatest frequency of these diseases does not correspond to the season of low water, (December, 1872, to May, 1873, 10 cases; June to November, 1873, 39 cases, and similar proportions during preceding years) does not disprove the effect of the water in their production. Though the water is more impure in winter and early summer, greater quantities of it are consumed in the hot season." But to this I may add that the total number of cases of diarrhœa and dysentery reported at this post during the four years ending June 30, 1874, was 132 out of an average annual mean strength of 233 officers and men, or 141 cases per 1000 of strength annually—*op. cit.*, p. 353. Now, diarrhœa to a much greater extent prevailed during the same period at posts where the purity of the water supply is beyond question.

‡ The following is Dr. PEALE'S memorandum, kindly furnished me December 18, 1877: "In October, 1876, Mr. Chittenden's division was in the desert like plateau country between White River and Grand River in northwestern Colorado. One afternoon the party camped about five o'clock, after a long and dry march. There were six men in the party and all exceedingly dry. Although the water in the stream was strongly alkaline, all drank of it in greater or less quantity. Coffee was made for supper, but had a bitter taste, and was in very slight demand. Potatoes boiled, with their skins on, in the water, were so bitter that they could not be eaten. As little of the water as possible was used during the evening, but extreme thirst obliged every one to use it to some extent. By a little after midnight every man had been roused, and by morning all had had several passages. For breakfast the water was generally avoided, but the diarrhœa continued all the early part of the day until no member of the party had less than six passages and one had nine. All were much weakened, although the passages were accompanied by little or no pain. The stools were invariably of a very dark color. Mr. Beehler's division, the same year, was in the adjoining district, (on the North,) and on the trip from White River to Yampah River all the members of his party were affected with diarrhœa. Using the water for tea or coffee did not render the water any less liable to affect them. In 1874 in South Park, Colorado, Mr. Beehler notes that two men of his party were affected by the use of alkaline water near the salt-works. In the spring of 1877 Mr. W. H. Jackson, the photographer of the survey, was in New Mexico, and says that all along the Rio Puerco the well water is very strongly alkaline, and whenever used by him gave him diarrhœa. He abstained as much as possible from its use, taking it in the form of tea and coffee, when it did not seem to affect him. The surface water was not so noticeably alkaline. The water had a *soapy* taste. The people living along the river are not affected by it. Mr. Jackson also says that the water in the neighborhood of St. George, in southwestern Utah, gave him diarrhœa, and that all along the route from St. George to Los Angelos, Cal., the water is very bitter and invariably affects both men and animals travelling over the route. Animals suffer most, as men use the water more cautiously. Mr. Wilson states that in 1872 he camped one night at a locality south and east from the Uintah Mountains, where his party were obliged to use an inky tasting mineral water that came from a stratum of rock near them. His entire party had diarrhœa, and the discharges were black. With some, the diarrhœa lasted several days, and others noticed the effects for more than a week. When the Union Pacific Railroad was being built through the Bitter Creek region, from Separation station to Green River, Wy. Ty., all the hands were affected by the water of the valley. The wells throughout this region are all strongly alkaline. It has been noticed that the riding and pack animals are always more affected than the men, as the latter are more cautious in its use. The men are, however, invariably affected to a greater or less degree, if they have to depend entirely on the alkaline water for drinking purposes."

The purgative properties of sea water are well known, and brackish waters so generally produce a laxative effect when first drunk, that their use has long been supposed to cause diarrhœa or even dysentery. Hippocrates* declared this opinion to be erroneous, and affirmed that the persistent use of saline waters is more likely to constipate than to loosen the bowels. In like manner, Rhazes† asserted that drinking brackish water at first relaxes, and afterwards constipates. But the old popular belief that such waters produce diarrhœa and dysentery has been again revived in modern times. Lempriere‡ mentioned that in his time the bowel complaints at Port Royal were attributed to the use of brackish water. Both Annesley and Twining§ believed that brackish water exercised a powerful influence in the production of dysentery. More recently, Norman Chevers|| has declared his belief that brackish water is a fertile cause of bowel complaints, especially of cholera and dysentery. According to Parkes,¶ the use of brackish water for drinking purposes formerly caused much diarrhœa at some of the Cape frontier stations. Now I do not doubt in the least the statement of the latter writer that the water of a certain well under his observation, having become brackish from the admixture of sea water, produced looseness of the bowels in almost all who used it;** nor do I doubt that this is the general effect of brackish waters when first drunk; but I distrust the assertion that their habitual use produces chronic fluxes or dysentery. I know of no instance in which these affections are said to have resulted from this cause in which it has been shown that the other causes of the intestinal fluxes were absent, and, indeed, in some of them the suspicion of other more dangerous contaminations of the drinking water itself has not been excluded.††

In a general way, then, my examination of this subject inclines me to the opinion that the effects of dissolved mineral substances in producing intestinal fluxes have been very greatly exaggerated. Of course it cannot be denied that, where other causes coexist, the purgative effect produced by the first use of certain waters may serve as the starting point for a serious flux; but where this is not the case most persons become accustomed to the use of waters containing a considerable quantity of impurities of this kind, they cease eventually to produce even a laxative effect, and it has yet to be shown by statistics that those who habitually make use of them are more prone to suffer from diarrhœa or dysentery than

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* HIPPOCRATES—*loc. cit.*, p. 599, *supra*—attributed the same effect to hard water: "For such waters as are adapted for boiling, and are of a very solvent nature, naturally loosen readily and melt down the bowels; but such as are intractable, hard, and by no means proper for boiling, these rather bind and dry up the bowels. People have deceived themselves with regard to salt waters, from inexperience, for they think these waters purgative, whereas they are the very reverse; for such waters are crude, and ill-adapted for boiling, so that the belly is more likely to be bound up than loosened by them." Transl. of F. ADAMS, printed for the Sydenham Society, Vol. I, 1849, p. 198. The translator adds: "Coray appears to me to be unnecessarily puzzled to account for our author's statement, that saltish waters, although held to be purgative, are, in fact, astringent of the bowels. But, although their primary effect certainly be cathartic, is it not undeniable that their secondary effect is to induce or aggravate constipation of the bowels?"

† RHAZES—*loc. cit.*, p. 599, *supra*—clearly enunciates the view expressed in the note of ADAMS, just cited.

‡ WM. LEMPRIERE—*Pract. Obs. on the Diseases of the Army in Jamaica*, London, 1799, Vol. I—states that the wells at Kingston, Jamaica, "from their vicinity to the sea, furnish water of a brackish quality, that is very apt to disagree with the bowels," p. 90; and elsewhere that the bowel complaints at Port Royal "are attributed to the water, which is often brought in a brackish state" to that place, p. 125.

§ ANNESLEY—*Dis. of India*, London, 1828, Vol. II, p. 215: "We have frequently remarked the very powerful influence of brackish water, and water which has been kept for a considerable time shut up from the air, and in a stagnant condition, and particularly water taken from marshes, in the production of dysentery." TWINING—*Diseases of Bengal*, 2d Ed., Calcutta, 1835, Vol. I, p. 58, note: "When an extensive inundation of the sea has laid waste a large extent of some of the maritime districts, and filled the tanks, the poor natives are much distressed and obliged to go a great distance for fresh water. The next hot-weather generally dries up the salt-water in the tanks; and when they are again filled by the succeeding rains, the natives, from their indolence, apathy, and pressing necessities, drink the water strongly impregnated by the saline deposit on the sides of the tanks, and then a destructive dysentery rages in a whole district, and carries off many of those who had escaped from the inundation, and succeeding famine." But to what extent were such epidemics due to the famine, and what part was actually played by the brackish water? If the latter were the cause, it is strange that we do not possess more abundant modern testimony to that effect.

|| NORMAN CHEVERS—*The sanitary position and obligations of the inhabitants of Calcutta*, the Indian Annals of Med. Sci., No. 17, 1864, p. 70: "The land on which Calcutta is built, and, indeed all the country eastward to Dacca, is strongly impregnated with salt;" and he declares that "brackish water is a fertile cause of bowel complaints, especially of cholera and of dysentery, the most prevalent and intractable of all Calcutta diseases."

¶ PARKES—p. 40, *op. cit.*, p. 599, *supra*.

** PARKES—*loc. cit.* In this case he states that he found "the amount of chloride of sodium to be 253 grains per gallon."

†† Thus, in the Calcutta wells referred to by CHEVERS—note ||, *supra*—the probability of sewage contamination appears to have been overlooked

others. Of course, too, I readily admit the poisonous effects produced by water contaminated with certain metals, such as lead, copper, &c., but a discussion of these impurities and their effects would be foreign to my present purpose.

*Organic matters of vegetable origin.*—Vegetable impurities may exist in drinking water either in suspension or solution, and in various stages of decomposition. They abound in the waters of marshes and in stagnant ponds on whose borders a rank vegetation luxuriates. Surface pools or shallow excavations, dug in forests and filled by the rain, are sometimes highly charged with impurities of this kind, especially after they have been concentrated by evaporation during long spells of dry weather. As I have already mentioned, the Greek and Arabian physicians believed the use of such waters to produce fluxes as well as fevers. In modern times these views have to a great extent lost credit, yet they have been maintained by a few recent writers, as, for example, by Grellois,* who, however, has not adduced any very strong evidence in their favor. Still more general is the belief that, although the periodic fevers are not caused by drinking water contaminated by vegetable impurities, its use may give rise to intestinal fluxes. A few instances which appear to support this view can be found in literature. Thus Davy† has attributed an epidemic of dysentery in a regiment belonging to the English garrison of the island of Antigua, in 1845, to drinking rain water from tanks in which, in consequence of a prolonged drought, a considerable quantity of such impurities had collected, and Gore‡ has reported an instance in which vegetable impurities, washed from the surface into a shallow well, gave rise to a violent diarrhœa among those who drank the water, which ceased when the well was cleaned out and protected from further contamination. But there are not many instances where the use of such water appears to have caused fluxes in which the coexistence of organic impurities of animal origin is not probable.

* GRELLOIS—p 185, *op. cit.*, note ‡, p. 603, *supra*—in illustration of his opinion, so far as dysentery is concerned, cites particularly the case of the epidemic of dysentery which was so fatal in the Danish army in Scania during the year 1677. The same epidemic is also cited to sustain the same view by COLIN, p. 249, *op. cit.*, note **, p. 401, *supra*. An examination of the original account shows what slender support to the opinions in question is to be derived from this source. PAUL BRAND—*De dysenteria castrensi ejusque causa verminosa et curatione*, Acta Med. et Phil. Hafniensia, T. V, 1680, p. 96—a medical officer in the army at the time referred to, saw, or believed he saw, in the stools of the dysenteric subjects, great numbers of animalcula of divers forms and sizes, which wriggled about like eels, "animalcula quædam anguineo flexu gregatim perreptantia variæ magnitudinis et formæ," and laments that he did not have a microscope to enable him to make a correct drawing of them. Here, he cries, is a beautiful illustration of the animated pathology! "observationes pathologiam animatam optime illustrantes," [see p. 369, *supra*, and note;] the atrocious pains of the disease are no doubt caused by these most ungrateful guests lancinating and mordicating the intestine of their host. Now whether these animalcula were derived from the stagnant water which the soldiers drank or the bad beer with which they were supplied, or whether they found their way into the system with the impure air breathed or the bad food used, he was not quite sure, but inclined to the opinion that the water was in fault, for, three years previously, the celebrated LEEUWENHOEK had shown him with the microscope a drop of water containing the most innumerable animalcula. In consequence of this opinion he had recourse to various vermifuges to cure his patients, especially to preparations of absinth, and with advantage. I suppose this narrative to have no value whatever as testimony that the water used by the Danish army had anything to do with their dysentery. OZANAM—*Hist. Med. des Maladies Épidém.*, 2me Éd., Paris, 1835, T. III, p. 285—from whom GRELLOIS takes the story, [COLIN takes it from GRELLOIS,] says: "The cause of this epidemic has been attributed to the stagnant water and spoiled beer the soldiers drank, and to air charged with impure exhalations," [he omits to mention either the bad food or the animalcula,] but what evidence is there that the water had anything to do with the disease? Clearly the animalcula alone.

† JOHN DAVY—*On some of the more important Diseases of the Army*, London, 1852, p. 69 *et. seq.*: "In the island of Antigua, where there are few springs, and rain water collected in tanks is much used, dysentery has always been of common occurrence during a period of drought. * * * In 1845, a year of unusual drought, when during 51 days no rain fell, and during other 40 very little, four companies of the 71st Regiment, stationed at the 'Ridge' barracks in the same island, and using tank water—its dregs—in less than twelve months lost 52 men from dysentery and diarrhœa." ("During the quarter ending the 31st October, out of a strength of 390, there were 141 cases of dysentery in hospital, of which 21 proved fatal.) I examined a portion of the water; I found it abounding in impurities, especially infusoria,—justifying the term dregs. The tanks, which had but little attention paid to them previously for a long while, were cleaned out, replenished as soon as the usual rains set in, and then yielding a purer water, the endemic subsided." I note in this case first that the notion that the infusoria are *per se* injurious is ridiculous. What the impurities really were is not shown, both vegetable and animal organic matter may accumulate in uncleaned tanks, but in this case it is not clearly shown that the condition of the tanks was a cause of the dysentery, or that the disease would not have ceased, as it did at its usual time, if the tanks had not been cleaned.

‡ PARKES—*Report on Hygiene for the year* 1864, Statistical, Sanitary and Medical Reports for the year 1863, London, 1865, p. 428. The facts were communicated by Staff Assistant-Surgeon A. A. GORE: the well was situated at Bulama, on the west coast of Africa. During August, 1864, its water produced violent diarrhœa in those who drank it. It was quite milky with vegetable impurities, which were separable by filtration. The well in question was merely a shallow hole dug at the site of a spring, and the impurities were washed in with the surface waters after rains. When filtered the water was quite harmless: "As soon as this was ascertained a good trench was dug round the well to arrest the surface-water, and an outlet trench to carry off this water was also provided; the edges of the well were raised so that no surface impurity could get in, the well was cleaned out and covered with a thatched roof. Next day the water was quite clean and without a particle of impurity, and the diarrhœa ceased. Dr. Gore mentions that in the recent epidemic of diarrhœa on the Gold Coast, the well water was said to have this milky appearance."

The ablest advocate of the view that vegetable impurities in drinking water cause intestinal fluxes, but not periodic fevers, is certainly Colin,* the greater part of whose interesting essay is occupied by the presentation of facts and arguments designed to prove the second of these propositions. His principal argument in favor of the first is drawn from the consideration that troops suffer more from fluxes during campaigns, when they are often compelled to use the stagnant waters of pools, surface wells and ditches which are impregnated with decomposing vegetable matter, than they do in garrison, where the water supply is usually good. But other potent causes of fluxes, having no connection with the drinking water, are too often also in operation during military campaigns, and, moreover, the water of surface wells and ditches as actually used by armies is too often contaminated by impurities of animal origin supplied by the troops themselves, that are far more to be dreaded than the doubtful effects of decomposing vegetable matter.

I may add that the few experiments which have been instituted for the purpose of ascertaining by direct observation the effects of the products of vegetable decomposition when imbibed with drinking water have yielded only negative results. Such was the issue of the elaborate investigation of Parent-Duchatelet and Andral† with putrid infusions of hemp, and of the less extended experiments of Minzi‡ with dew condensed in unhealthy localities in the vicinity of Rome and Terracina. On the whole, therefore, I do not hesitate to accept the opinion of Parkes§ that we have not, up to the present time, accumulated sufficient evidence to prove that the dissolved vegetable impurities ordinarily encountered in drinking water give rise to intestinal fluxes, and that even in the case of vegetable matters in suspension the testimony is by no means conclusive; in truth the opinions hitherto advanced as to the causation of fevers and fluxes by these impurities are to be regarded rather as ingenious conjectures than as sober deductions from well-established facts.

*Organic matters of animal origin.*—Much more abundant is the testimony which appears to connect impurities of drinking water derived from decomposing animal matter, whether in suspension or solution, with the production of intestinal fluxes; and although a great deal of this testimony is very far from conclusive, yet it is of a character to awaken grave suspicion with regard to the safety of using water thus contaminated, and to indicate the urgent necessity for further and more precise investigations.

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* COLIN—*op. cit.*, note **, p. 401, *supra*. We should, however, be obliged to reject at once both the conclusions of COLIN, if we could place any confidence in the extraordinary results arrived at by Assistant Surgeon CHARLES SMART, U. S. A.—*On Mountain Fever and Malarious Waters*, The Amer. Jour. of the Med. Sci., Vol. LXXXV, 1878, p. 17—who claims to have found, by the process of WANKLYN and CHAPMAN, a quantity of "organic ammonia" in the snow-fall at Camp Douglas, Utah, which, on some occasions, was as great or even greater—*e. g.*, March 21, 1876, organic ammonia .60 parts per million, p. 30—than the percentage found by the authors of the process in the filthy water of Thames river at London bridge at high tide, which ranged from .35 to .59 parts per million—WANKLYN and CHAPMAN, *Water Analysis*, 4th Ed., London, 1876, p. 40. Dr. SMART has no doubts whatever as to the accuracy of his analyses, which he tells us "were carefully performed, and that the experience gained in conducting *over fifty* distillations for organic matter in potable waters superintended their performance," p. 30. Now, I call attention to the fact that all this organic matter, if it really had any objective existence, is not claimed to have produced either diarrhœa or dysentery, but "mountain fever," which Dr. SMART regards as a "malarial remittent fever with adynamic tendencies," p. 34. I shall have occasion hereafter, when discussing the etiology of malarial fevers, to refer to the arguments brought forward in this paper in favor of "the probable presence of malaria *in the snow*," p. 35.

† PARENT-DUCHATELET—T. II, p. 509 *et seq.*, *op. cit.*, p. 606, *supra*—in the course of his investigations as to the effects of the maceration of hemp on workmen and others—*Le Rouissage du chanvre considéré sous le rapport de l'hygiène publique*, (1832)—drank himself, in three doses, three centilitres of the infusion in a condition so putrid that it turned his stomach, ["ces trois doses me barbouillèrent un peu le cœur,"] but without experiencing the least indisposition from it. Similar results followed the ingestion of hemp infusion by others, and finally, at his request, ANDRAL experimented with the same infusion on seventeen patients whose digestive organs were in good order, and without producing any ill effect. ANDRAL himself reported: "I believe I may conclude from these trials that water in which hemp has been macerated so long that it exhales the most fœtid odor ("une odeur des plus fétides") can be given as drink without any kind of accident resulting from it."

‡ MINZI—*Sopra la genesi delle febbri intermittenti*, Rome, 1844; I have not obtained access to this work, and cite from COLIN, p. 272, *op. cit.*, p. 401, *supra*—collected during the month of August the dew from certain notoriously unhealthy localities in the vicinity of Rome and Terracina in sufficient quantities to enable himself and eight other persons to drink each several ounces of it. No effects were produced by this experiment. COLIN—p. 271, *op. cit.*—remarks that while some persons, like those experimented on by PARENT-DUCHATELET, have experienced no ill effects from drinking water containing decomposing vegetable matters, others not merely felt disgust, but suffered from nausea or even vomiting and intestinal troubles. I know not where to find the original account of these latter observations, to which no reference is given.

§ PARKES—p. 39, *op. cit.*, p. 509, *supra*.

It is well known that the use of tainted meat as food sometimes occasions violent intestinal catarrhs, and there is no doubt that the use of drinking water sufficiently impregnated with the products of decomposition from the dead bodies of animals or men will give rise to similar symptoms. Hence the water from wells in the vicinity of cemeteries* has long had an evil reputation. That this has been, in some cases, deserved I do not doubt, but the instances in which intestinal fluxes have been traced unmistakably to this cause are rare indeed.† Chemical analysis has indicated the contamination of the water of such wells with organic matter in a few cases; indeed, in some of these, as in the well water analyzed by Lefort,‡ the odor and taste sufficiently indicated the nature of the impurities present. But recent systematic investigations of the water of wells actually situated within the limits of cemeteries in Berlin, Carlsruhe and Dresden show that it is often quite impossible to detect in it any considerable quantity of organic impurity by chemical analysis, and that it is usually drunk with impunity by the keepers and their families.§ I am compelled, therefore, to agree with Pettenkofer,‖ that the actual evil effects of the impurities derived from this source have been very greatly exaggerated. The distance of the well from the cemetery affords no indication of the danger, but the character of the subsoil and the direction of its drainage must be taken into account; moreover, the disinfecting power of the soil itself must not be forgotten.

Some of the most striking illustrations of the morbific influence of well water thus contaminated, which pass current in medical literature, will not bear critical investigation. Among these, perhaps, the most interesting to the military surgeon is said to have occurred at Ciudad Rodrigo (1813) during the Peninsular campaigns, where it is alleged that the well water was contaminated in consequence of the burial within a short time of 20,000 bodies, and that those who drank it were attacked with malignant fevers and dysentery. I find this story repeated not only in the monographs on the danger of intramural interments, but in some of the best modern text-books on hygiene; it is usually credited to Sir James McGrigor, but that distinguished physician, in his sketch of the

* It would occupy more space than can be spared to attempt to present the literature of this subject. I may, however, refer to a few works, *e.g.*, E. CHADWICK—*A supplementary report on the results of a special inquiry into the practice of interment in towns*, London, 1843, p. 26; WM. LEE—*Report to the General Board of Health on interments in towns visited during* 1849–1850, London, 1851—who says of the churchyard at Newcastle-under-Lyme: "The drainage from it percolates through the walls into the street; the people inhale the putrid matter floating in the atmosphere and drink water from wells polluted with decayed human remains," p. 4. Near this cemetery he found a public house the cellar of which was "two feet deep of horrible fluid with the churchyard odour, * * * and the water in a well, four yards from the public-house cellar, was full of flocculent animal matter with the same stench. The sequel is awful. The publican's wife had recently died of cholera, and he and two sons had had diarrhœa" &c., p. 5. See, also, WM. EASSIE—*Cremation of the dead*, London, 1875, p. 61 *et seq.* PARKES—p. 39, *op. cit.*, p. 599, *supra*—declares, in speaking of the influence of bad water in producing diarrhœa, "the animal organic matter derived from graveyards appears to be especially hurtful."

† See J. F. A. ADAMS—*Cremation and burial*, Sixth Annual Report of the Massachusetts State Board of Health, Boston, 1875, p. 300—who declares that in Massachusetts, "after a diligent inquiry, we have been unsuccessful in obtaining a single example of disease presumably induced by water contaminated by the proximity of burial-grounds." So, also, on p. 278: "In searching for cases of recent date of disease resulting from grave yard infection, we find that such are almost unknown to medical literature."

‡ J. LEFORT—*Remarques sur l'altération des eaux de puits par le voisinage des cimetières*; I cite from the report in the Bull. de l'Acad. de Méd. T. XXXVI, 1871, p. 610—found in the commune of St. Didier (Allier) a well situated 50 metres from the cemetery which had a nauseous odor, very fetid taste, and contained a notable quantity of ammoniacal compounds.

§ ROTH und LEX—p. 22, *op. cit.*, p. 601, *supra*—state that the water of fifteen wells in Berlin churchyards proved on analysis to contain nitrates in smaller quantity than the mean found in the city wells. Two wells in churchyards at Carlsruhe contained, one more the other less nitrates than the mean of eleven city wells. An official investigation of the wells in the churchyards of Berlin showed that, with a few exceptions, the water was not only clear, odorless and tasteless, but also quite poor in organic constituents. See, also, with regard to this last investigation, Berlin Klin. Wochenschrift June, 1865, p. 254. FLECK—*Jahresbericht der Chemischen Centralstelle für Oeff. Gesundheitspflege*, Dresden, 1873; I have not seen this work, and cite from ADAMS, p. 280, *op. cit.*, *supra*—analyzed, in 1872, the water of 22 wells situated in nine of the Dresden cemeteries; he found a variable amount of organic contamination, but not on the whole more than in the other wells of Dresden, and remarks: "Of injurious physiological effects arising from the use of the water of the cemeteries of Dresden, there is no proof, as far as the author's knowledge extends. Moreover, it should, on the other hand, be mentioned that in each cemetery the well which is situated nearest to the grave-digger's house is used without regard to its quality by the grave-digger and his family, and up to the present time there has been no cause whatever for forbidding the use of the well. But, indeed, the composition of the cemetery-water does not differ essentially from that of the average well-waters of Dresden in respect to the decomposing organic matter, as may be seen by comparing with the above results the following determinations of the character of the water from various wells within the city." Then follow analyses of 17 city wells which sustain the opinion advanced. These analyses were repeated by FLECK, in 1873, with very similar results.

‖ MAX PETTENKOFER—*Ueber die Wahl der Begräbnissplätze*, Zeitschrift für Biologie, Bd. I, 1865, S. 45.

medical history of the Peninsular campaigns, speaks only of the evil effects of the aerial effluvia from these hasty burials. He presents no facts to show that the well water used was contaminated, nor does he express the opinion that it was. According to his narrative the dysenteries and fevers broke out, and were sent to hospital elsewhere, and the hospitals were subsequently moved to Ciudad Rodrigo, where a number of causes conspired to produce a great mortality. I find no proof that impure well water was one of these.* The statement of Parkes,† that the prevalent dysentery at Secunderabad, in the Deccan, appears to have been partly owing to the use of water which percolated through a large graveyard, is supported by better evidence, but even in this case the testimony is far from conclusive.

We have much more abundant and more satisfactory information with regard to the injurious effects of water contaminated with *decomposing fæcal matters*, and from the nature of the case it is probable that impurities of this kind are much more frequently present than those just discussed. In towns and villages where the water supply is from

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*I find this story first, in the shape referred to, in the testimony of Dr. JAMES COPLAND before a committee of the House of Commons—*Report from the select committee on improvement of the health of towns*, ordered by the House of Commons to be printed June 14, 1842. Minutes of evidence, p. 156. He said: "It is fully ascertained and well recognized that the alluvial soil, or whatever soil that receives the exuviæ of animal matter, or the bodies of dead animals, will become remarkably rich in general; it will abound in animal matter, and the water that percolates through the soil thus enriched will thus become injurious to the health of individuals using it; that has been proved on many occasions, and especially in warm climates, and several very remarkable facts illustrative of it occurred in the Peninsula campaigns. It was found, for instance, at Ciudad Rodrigo, where, as Sir James Macgregor states, in his account of the health of the army, there were 20,000 dead bodies put into the ground within the space of two or three months, that this circumstance appeared to influence the health of the troops, inasmuch as for some months afterwards all those exposed to the emanations from the soil, as well as obliged to drink the water from the sunk wells, were affected by malignant and low fevers and by dysenteries, or fevers frequently putting on a dysenteric character." Now, Dr. COPLAND'S testimony, from which the above is taken, appears to have been given off hand, and with a good deal of "ex cathedra" positiveness. I do not, however, understand him to attribute any statement to Sir JAMES MCGRIGOR, except with regard to the number of bodies buried within a few months, which is quite correct. The rest represents simply his own inferences and opinions, for which he cites the testimony of no eye-witness. CHADWICK—p. 26, *op. cit.*, p. 611, *supra*—gives textually the extract I have cited, and merely speaks of it as a part of the testimony of COPLAND. But subsequent writers have not been so careful; thus, in the *Report on a general scheme for extramural sepulture, presented to both Houses of Parliament by command of Her Majesty*, London, 1850, p. 9, the whole story is attributed to Sir JAMES. The same is done by J. H. RAUCH—*Intramural interments in populous cities*, Chicago, 1866, p. 20. PARKES—p. 42, *op. cit.*, p. 599, *supra*—gives a somewhat different version: "The great loss by dysentery in the Peninsula, at Ciudad Rodrigo, was partly attributed by Sir J. MCGRIGOR to the use of water passing through a cemetery where nearly 20,000 bodies had been hastily interred." ROTH und LEX—p. 26, *op. cit.*, p. 601, *supra*—repeat this, but avowedly on the authority of PARKES. Now, so far as I have been able to ascertain, the only authority for this story is the loose testimony of COPLAND, which is certainly not sustained by the narrative of Sir JAMES MCGRIGOR—*Sketch of the medical history of the British armies in the Peninsula of Spain and Portugal during the late campaigns*, Medico-Chirurgical Trans., Vol. VI, 2d Ed., London, 1819, p. 422 *et seq.*—who relates that "dysentery appeared in the greatest number in the early part of 1813; but it had its origin, in the operations of the campaign of the former year." The army, during June and July, traversed Castile, exposed to a burning sun by day, and bivouacking during the night in arid unsheltered plains. They felt at times every vicissitude of heat and cold, were not regularly supplied with food, often indulged in unripe fruit and bad wine. "About the 20th July, the army began to make a retrograde movement; and the hospitals, particularly those at Salamanca, containing some thousand men ill chiefly of diarrhœa, dysentery, or remittent fever, were suddenly broken up, and the sick hurried off to the rear to Ciudad Rodrigo, which was the nearest hospital station to the frontier of Portugal." It will be observed that the men were taken sick with these diseases elsewhere, and were sent while sick to Ciudad Rodrigo. "The situation of this place is by no means favourable for an hospital station; it proved a source of great mortality to us; however we had no choice. The town is composed chiefly of ruins, with very narrow streets and some of them without a single inhabitant. It had been so much the object of contest, and alternately the site of the hospitals of all the contending armies, that nearly 20,000 bodies were calculated to have been put into the earth either in the town or under its walls in the course of a few months. Independently of these circumstances, the situation of Ciudad Rodrigo is unhealthy; it may therefore be imagined that its atmosphere was not the purest, and the surprise will not be great, that among the many conveyed to its hospitals from the front, a considerable mortality ensued notwithstanding every effort of the medical department ably conducted by Dr. Neale." It will be observed that Sir JAMES blamed the air, not the water, nor do I find in his able narrative any allusion to the water supply at Ciudad Rodrigo, or any evidence that it was contaminated in consequence of the interments mentioned.

†PARKES—p. 41, *op. cit.*, p. 599, *supra:* "Its constant prevalence at Secunderabad, in the Deccan, appears to have been partly owing to the water which percolated through a large graveyard. One of the sources of water contained 119 grains of solids per gallon, and in some instances there were 8, 11 and even 30 grains per gallon of organic matter, *(Indian Report*, p. 44.)" The authority cited is the *Report of the Royal Commission on the Sanitary State of the Army in India*, London, 1863, Vol. I, p. 44, where I find the analyses cited as above, but nothing is there said about the graveyard. In the stational report—Vol. II, p. 356—I find it mentioned that "there are four burial grounds used by the British troops, all within the station," but I find no hint that drinking water owed its organic matter to this source. If, then, the paragraph cited from PARKES is intended as more than a mere conjecture, he must have been in possession of some additional evidence, which he does not cite, and until this is accessible it is impossible not to regard his opinion with a certain degree of reserve. I may point out as a further reason for caution, that, while the medical statistics of the post—Vol. II, p. 351—show a great prevalence of dysentery during the official year 1858–9, the figures representing no less than 430.+ cases and 30.+ deaths per 1,000 of strength among the European troops, the figures for the official year 1857–8 represent only 49.+ cases and 2.+ deaths per 1,000 of strength, though the graveyards were, I suppose, in the same place. Further particulars with regard to the composition of the well water at Secunderabad will be found in the official report on *Water Analysis in the Madras Presidency*, for 1871, p. 44, and Appendix, p. 68, from which it appears that several of the wells are situated near graveyards, and it is stated by the analyst, Dr. HASTINGS, in the case of one well, No. 29, that it contains a large excess of organic matter, and receives in all probability drainage from the neighboring graveyard. Yet precisely this well is recommended by him for use in cholera times: "No. 29 well contains a large excess of organic matter, receiving in all probability part of the drainage from the neighbouring graveyard. It has the further disadvantage of being close to a line of barracks; but it possesses the great advantage, that being within the barrack-square, it can in cholera times be easily secured against the possibility of the introduction into it of choleraic discharges. The water of this well is not fit for drinking purposes; but it would be a much safer drinking water if properly purified by boiling, &c., and secured against the possibility of contamination by choleraic or other discharges, than the water of any other well not thus secured; no matter how pure previous analyses may have shown it to have been," p. 69.

wells, the contamination may take place by filtration from adjoining sewers, or privy vaults, or by overflow during heavy rains or floods; and the surface wells and rivulets, which so often afford the only drinking water of camps, are peculiarly exposed to similar impurities. Here the danger consists not merely in the presence of decomposing animal matter, but in the probable existence of specific contagia derived from the dejecta of the sick. Recent investigation has rendered it highly probable that both cholera and typhoid fever may be propagated in this way,* and the same has often been asserted to be true of diarrhœa and dysentery, but the evidence brought forward is far from conclusive, although there is enough to warrant grave suspicion.

The old observation of Read,† (1770,) who believed he had traced an epidemic of dysentery to the use of well water contaminated by adjacent latrines, is not an isolated one, but appears to be supported by several recent incidents of a similar character. I may refer, in illustration, to the observations of Oakes,‡ who traced an outbreak of dysentery at Cape Coast Castle, on the west coast of Africa, to the passage of sewage from a cess-pool into one of the tanks; and to the account given by Kraft§ of the prevalence of intestinal catarrhs and dysentery in Prague, after the spring floods of 1862 had washed sewage and surface impurities into the wells. Greenhow‖ concluded, from his investigation of the districts of England in which alvine fluxes produce the greatest mortality, that a high death-rate from these disorders always coexisted either with the tainting of the atmosphere by the products of organic decomposition, especially of human excrement, or with the habitual drinking of impure water. Sewage contamination most probably explains the presence of the organic impurities in the water of the canal de l'Ourcq, which appears from the narrative of Champouillon¶ to have caused an outbreak of dysentery in a French regiment in

* See PARKES—p. 44 *et seq.*, *op. cit.* The relation of the drinking water to typhoid fever will be referred to in the chapter on fever.

† READ—*Obs. sur la dysenterie qui a été traitée à l'hôpital militaire de Metz pendant le mois de Juillet*, 1781, Jour. de Méd. Militaire, T. I. 1782, p. 181—has related that during August and September, 1770, one of two regiments lodged in the barracks in the Chambierre quarter of Metz suffered greatly from dysentery, while the other had but few cases. On inquiry it was found that the former obtained its drinking water from two wells which proved to be contaminated with fæcal matters filtered from the neighboring latrines, while the latter drank from two other wells not so contaminated. The impure wells were closed, and the disease speedily diminished. In 1781 dysentery broke out, in the month of July, in two regiments lodged in the same barracks. The wells were again closed, with advantage.

‡ PARKES—p. 41, *op. cit.*: "On the West Coast of Africa (Cape Coast Castle), an attack of dysentery was traced by Assistant-Surgeon Oakes to the passage of sewage from a cess-pool into one of the tanks. This was remedied, and the result was the almost total disappearance of the disease."

§ KRAFT—*Bericht über die in Folge der Ueberschwemmung von 1. und 2. Februar 1862 in Prag beobachteten Krankheitszustände*, Prager Vierteljahrschrift für die Prakt. Heilk., Bd. III, 1862, S. 141. This observation is the more significant because the resulting fluxes occurred so much earlier in the year than they usually do.

‖ GREENHOW—*Reports on the prevalence and causes of diarrhœa at Coventry, Birmingham, &c.*, Second Report of the Medical Officer of the Privy Council, for 1859, Appendix, p. 65—concludes, from the evidence which he presents in detail, that "the excess of mortality has in all the places been coincident with one or other of two definite local circumstances: a. The tainting of the atmosphere with the products of organic decomposition, especially of human excrement. b. The habitual drinking of impure water," p. 160. In like manner BUCHANAN—*Report on the results which have hitherto been gained in various ports of England by works and regulations designed to promote the public health*, Ninth Report of the Medical Officer of the Privy Council for 1866, p. 46—concluded from his investigations that "diarrhœa is another disease which appears to have been reduced by purification of air and water." He gives, in support of this statement, the death-rate from diarrhœa before and after the completion of works for the improvement of the drainage and water supply in 24 towns. The conclusion cited has been justly criticised by VIRCHOW—*Cynolisation oder Abfuhr*, Virchow's Archiv, Bd. XLV, 1869, S. 296—who has correctly pointed out that, although in twelve of the towns in BUCHANAN'S table a diminution of diarrhœa followed the sanitary works, in twelve others there was actually an increase in the mortality of the disease, and that the percentage of the change in these latter cases is as great—in two cases even greater—than in the former. VIRCHOW further criticises the method of these English investigations, especially the nomenclature employed: "And what does diarrhœa signify? Was it dysentery, that is an infectious disease? Does not a part of it belong to phthisis? Ought not many of the cases to be counted with typhus? In the last connection it is certainly not unimportant that Worthing, Penzance, Chelmsford, Carlisle, Rugby, which have so much typhus, show all of them an increase in the diarrhœa mortality. Certainly it is to be concluded from all this that the English nomenclature is as yet very bad, and that their statistical figures as yet repose on a very uncertain foundation." I may add, however, that in subsequent portions of his report BUCHANAN gives the figures of dysentery separately for all the towns in the table referred to except Cardiff and Ely. These figures are in most of the cases quite small; in more than half of them less than 1 death per 10,000 of population annually. I note that in six of the towns the mortality from dysentery increased after the sanitary works; in two it remained unchanged, and in fourteen it diminished.

¶ CHAMPOUILLON—*Quelques Obs. relatives au régime alimentaire du soldat*, Rec. de Mém. de Méd., de Chir. et de Pharm. Militaires, T. XXVII, 1871, p. 230—states that in the year 1852, during the month of August, the 19th light regiment suffered greatly from dysentery, while the 44th regiment of the line had only a few cases of diarrhœa. They both occupied the caserne de Reuilly, (Paris,) and both drank the water of the canal de l'Ourcq, which contained much organic matter. But on inquiry it was found that the men of the 19th regiment mixed their drinking water with brandy, which merely precipitated the organic matter on the sides of the vessels where it putrefied, so that the mixture became quite offensive on standing; while those of the 44th mixed their water with red wine or made coffee with it, and in both cases the tannin seemed to exert an antiseptic influence. Red wine having been supplied to the 19th regiment in lieu of brandy the disease abated almost immediately.

1852; and similar impurities must have existed in the muddy canals of the plains of Peï-ho, if it be true, as stated by Falot,* that the use of their water for drinking purposes produced dysentery among the allied troops in China.

Oldekop† has testified that the water of the Volga at Astrachan, which he accuses not merely of producing a purgative effect when first used, but also of occasioning choleraic symptoms and chronic diarrhœas, is impregnated with sewage; and when Ilisch‡ declared that the water of the Neva at St. Petersburg, the drinking of which is said to give rise to diarrhœa, is rich in organic substances, he probably had a similar contamination in view. An observation reported by Greenhow§ seems to show also that water, without any direct admixture of sewage, may be so contaminated by the absorption of sewer gases as to become capable of generating diarrhœa in those who drink it; and Davy‖ has related an incident which seems to show that the use of water contaminated by the excreta of the human skin may give rise to bowel complaints and dysentery. It seems probable, moreover, that the use, for drinking purposes, of water contaminated with the fæcal discharges of animals may give rise to diarrhœa, as in the case of the village ponds described by Cox and the well analyzed by Schweizer,¶ but in such cases it sometimes happens that the probability of contamination with impurities of human origin is also very great, as, for example, in the case of the water which, according to Orabona,** produced an outbreak of dysentery on board the brig Le Génie.

The foregoing are some of the more striking of the observations brought forward in support of the opinion that water impregnated with decomposing animal matter, and especially with sewage, gives rise to diarrhœa and dysentery. Others have been adduced

* A. FALOT—*Relation méd. d'une campagne en Chine de* 1859 à 1862, Montpellier Thesis of 1863, which I have not been able to see, and cite from Barrallier, p. 719, *op. cit.*, p. 603, *supra*. He points out also that the Chinese who drank the same water, but always first boiled it, were very rarely attacked. This, however, does not correspond with the observation of DUDGEON, *vide infra*.

† F. OLDEKOP—*Die Lepra caspica*, Virchow's Archiv, Bd. XXVI, 1863, S. 117—represents the water as being also yellowish and turbid.

‡ ILISCH—in the Verhandlungen des Cholera-Congresses zu Weimar, p. 14, which I have not been able to see, and quote from ROTH and LEX, S. 24, *op. cit.*, p. 601, *supra*. The following extract is from the latter citation: "In Petersburg ist es bekannt, dass das Trinkwasser, welches dort allgemein aus der Newa bezogen wird und reich an organischen Substanzen ist, namentlich auf Fremde eine diarrhöische Wirkung äussert." I regard both this statement and that of OLDEKOP with distrust, for reasons which will be given further on.

§ GREENHOW—Appendix, p. 153, *op. cit.*, p. 613, *supra*. The observation referred to relates to an outbreak of diarrhœa in the New Bailey prison at Salford, which proved to be due to drinking water from a cistern. This "communicated with the common sewer by means of an untrapped waste-pipe, allowing free passage of the sewer gases into the cistern. * * * The cistern was covered over with boards which confined the gases so as to favour their absorption by the water."

‖ DAVY—p. 69, *op. cit.*, p. 609, *supra*—relates that the troops stationed at Morne Bruce, in the island of Dominica, were very subject to bowel complaints and dysentery. They were supplied with drinking water by an open conduit defiled by washing clothes in it: "As soon as it was covered over, the impurities excluded, the occurrence of the disease was arrested; from that time at least it ceased to be endemic." But what kind of dirty clothes were washed? Did they include children's diapers or the bedclothes of dysenteric subjects soiled with the discharges? Without particulars of this kind, carefully observed, the value of the observation is lost.

¶ W. I. COX—*Epidemics and their every day causes*, The Sanitary Review, Vol. IV, 1858, p. 254—relates that in a village of 30 or 40 cottages, observed by him, the inhabitants "use no other water than that afforded by surface pools; the majority of which are, during the summer and autumn, covered with vegetable life, slimy, and bubbling with the liberated products of decomposition. They are all uncovered, sunk below the general level of the ground. Hundreds of donkeys, pigs, and geese, graze close to the brink." These people suffered from choleraic diarrhœa, while a neighboring village remained free. The water of the largest pool contained "five grains of organic matter in the imperial gallon." E. SCHWEIZER'S analysis will be found reported in Oesterlen's Zeitschr. für Hygieine, &c., Bd. I, 1859-60, S. 166—*Merkwürdiges Vorkommen von Buttersäure im Wasser eines Brunnens*. The use of the water of this well produced serious diarrhœa not merely in the persons who drank it, but in domestic animals, some of which died. The water was clear and colorless, but contained considerable quantities of butyrate of lime, showing contamination by organic matter. The source of these impurities proved to be a neighboring ditch filled with vegetable garbage, the fæces of animals, &c., [in short, a dunghcap, I suppose.] Here, too, I may mention the account given by RAMBAUD—*Obs. sur la fièvre putride et maligne qui a régné à l'hôpital militaire de Sedan, pendant l'hiver de l'année* 1776 à 1777, Jour. de Méd. Mil., T. II, 1783, p. 480—of an epidemic which he attributed to the use for drinking purposes of water contaminated by stable manure. He speaks of the disease as a fever, but the absence of head symptoms and the frequent bloody stools, signalized in the narrative, incline me to agree with ESTIENNE—Rec. de Mém. de Méd. de Chir. et de Pharm. Militaires, T. XV, 1824, p. 83—who calls it a putrid dysentery. The garrison had just occupied new barracks, and no cause was found for the outbreak but the use of water recently dug in a place which had been used as a depot for the manure of the cavalry horses. The rains of autumn and the commencement of winter had washed much putrid and alkaline matters from the old dunghcaps into these wells. So soon as attention was drawn to this cause the use of the wells was forbidden, and, as the soldiers continued to drink from them, sentinels were placed which rendered their use impossible; but it is worthy of note that, "in spite of these precautions, the disease continued during a great part of the winter."

** I cite BARRALLIER—p. 719, *op. cit.*, p. 603, *supra*: "Orabona, in his Études méd. sur la côte de Zanzibar, reports that the epidemic which raged on the brig Le Génie was provoked by the abuse by the sailors of the crew of the water of McTony, a source supplied by a brook whose waters flowed over a black and muddy slime, mingled with detritus of all kinds, and disturbed unceasingly by the Arabs during their religious ablutions, and by the trampling of horses and other domestic animals."

of a far less convincing character. Especially has the use of the waters of certain rivers been accused on insufficient evidence. Thus the opinion of Foucaut and Gayme, that the dysentery of Cochin China is caused by drinking the water of the rivers of that country, which are said to abound in organic matters of both vegetable and animal origin, has been controverted by Frontgous and Bourgarel, and we have the more recent testimony of Antoine and Lenoir* that the use of rain water, distilled water, and even of water brought from France in iron tanks, has vainly been resorted to by the crews of ships visiting that unhealthy region with the hope of escaping its endemic fluxes. In like manner the conclusion of Cornuel, that the dysentery he witnessed at Guadeloupe was caused by drinking the water of the rivers of that island, seems rudely shaken by the subsequent testimony of Dutroulau,† who has shown that at St. Pierre, on the neighboring island of Martinique, where the prevailing dysentery was likewise attributed to the river water, the French garrison was for several years supplied with rain water for drinking purposes without any diminution in the ravages of the disease. In view of these observations, which show the futility of any effort to prevent dysentery by the use of rain water, or even of distilled water, for drinking purposes, it is not surprising that the employment of boiled water should likewise fail to protect. We have the recent testimony of Dudgeon‡ that, although boiled water is universally employed by the Chinese for drinking purposes, diarrhœa and dysentery are common among them.

Both in Europe and our own country fears have been expressed that the water of rivers may be so contaminated by the sewage of towns seated on their banks as to render their use farther down the stream injurious. But the English investigations seem to render it highly probable that when organic impurities are thus discharged into a running stream

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* A. FOUCAUT—*Essai sur les eaux du Cambodje*, Archives de Méd. Navale, T. IV, 1865, p. 225—found by analysis a considerable quantity of organic matters in the water of the Cambodje, and concluded from his study of the subject that "the local river and other waters in the province of My-thô are of bad quality on account of the large quantity of organic matter they contain;" and that "the use of these waters is one of the principal, though not the only cause of dysentery among the Europeans," p. 241. This opinion is sustained by J. B. L. GAYME—*De la dysenterie endémique dans la Basse-Cochinchine*, Montpellier Thesis, No. 10, 1866, p. 10 *et seq.*, also p. 18 *et seq.*, who declares that these waters "contain in abundance vegetable and animal débris," which, on account of the high temperature of the region, speedily enter into putrid decomposition, p. 18. These views have been controverted by A. FRONTGOUS—*Considérations sur la dysenterie observée en Cochinchine pendant les années* 1863-64, Montpellier Thesis, No. 30, 1866, p. 14, and A. C. A. BOURGAREL—*De la dysenterie endémique dans la Cochinchine Française*, Montpellier Thesis, No. 100, 1866, p. 27. F. ANTOINE—*Essai sur la diarrhée endémique de Cochinchine*, Paris Thesis, No. 256, 1873, p. 55—in reference to this discussion, declares that whenever this water "has been replaced by rain water, or ships have continued during their sojourn in Cochin China to use water brought from France, the intestinal derangements have not been the less frequent." J. M. H. LENOIR—*De la diarrhée chronique de Cochinchine*, Paris Thesis, No. 124, 1874, p. 16—gives two examples in illustration of the truth of this assertion. The first was communicated by a friend: On board the Tarn, only distilled water, or water brought from Toulon in iron tanks, was used for drinking purposes by the officers and crew; yet while the ship was at Saïgon numerous grave cases of flux occurred. The second fell under his own observation, when he visited Cochin China on the Corrèze; the same precautions were vainly enforced. The commanding officer, the surgeon and several other officers suffered from the disease.

† CORNUEL—*Mém. sur la dysenterie observée à la Basse-Terre, (Guadeloupe,)* Mém. de l'Acad. Royale de Méd., T. VIII, 1840, p. 103—expresses himself quite strongly: "J'ai pu remarquer que, la dysenterie ne se rencontrait que dans les lieux où l'on boit l'eau des rivières. A la Grande-Terre, à Marie-Galante, aux Saintes où il n'y a point de rivières, on ne boit que de l'eau de pluie ou de mare, et la dysenterie y est fort rare." This testimony is often cited as conclusive, but we learn from A. F. DUTROULAU—*Traité des Maladies des Européens dans les Pays Chauds*, 2me Éd., Paris, 1868, p. 563—that "the inhabitants of Fort-de-France, who drink only rain water, are persuaded when they come to St. Pierre that the diarrhœa by which they are often attacked is due to the use of the river water drunk there. At St. Louis the same accusation is directed against the river water, charged, it is said, with marsh matters during the rainy season, and brackish during the dry season." Nevertheless he assures us "that at St. Pierre the soldiers, whom it has been desired to remove from the influence of the river water, have drunk rain water for several years, but dysentery has none the less continued its ravages in the garrison." Moreover, in 1848, two French ships of war, the Brandon and the Embuscade, while at this place, had violent epidemics of dysentery on board. During the whole period the crew of the first drank nothing but distilled water, and the second, water brought from France, while at the same time the merchant ships in port, which took no such precautions, escaped.

‡ JOHN DUDGEON—*The diseases of China, etc.*, The Glasgow Med. Jour., Vol. IX, 1877, pp. 174 and 369: "But whatever be the water, and wheresoever the supply, it is invariably boiled by the Chinese," p. 191. If this statement be literally true, it seems to explain why, in spite of the contamination of the drinking water with sewage, typhoid fever should be so rare as it is said to be, p. 179 *et seq.* On the other hand, this precaution seems to have exercised no control whatever over the spread of cholera, p. 332, or of the alvine fluxes. "In summer, diarrhœa and dysentery are very frequent, caused chiefly by eating the early unripe fruits and vegetables, and in too great a quantity, and probably also by exposure at night and sudden and severe vicissitudes of temperature." It is true, DUDGEON further expresses the opinion that dysentery among the Chinese is less severe and less apt to be complicated by hepatic inflammation than among Europeans in China, but this contrast between natives and strangers usually exists in tropical climates, whether the natives drink boiled water or not. It would also appear from this paper that periodic fevers, alvine fluxes and small-pox are the chief diseases among the Chinese—p. 320 *et seq.*—which is in accord with the observations of WILSON—p. 337. The frequency of diarrhœa and dysentery among the Chinese is denied by PALOT—see note *, p. 614, *supra*—and the reason given that they use boiled water; but I presume the testimony of DUDGEON, who lived and practiced medicine among them, corresponds better with the facts.

they are speedily oxidized and become harmless.* Assistant Surgeon Willson,† of the 3d Michigan volunteers, attributed an outbreak of diarrhœa and dysentery in that regiment during March, 1862, to drinking the water of the Potomac river between Alexandria and Washington, where it is contaminated with the sewage of the latter city. I feel much doubt as to the correctness of this opinion. At the time referred to in his narrative the Army of the Potomac was shipped on transports for the Peninsula, and no similar complaint was made by any of the numerous other regiments compelled to drink Potomac water at the same time.

On the whole, it must be admitted that the evidence relied upon to connect impurities of animal origin in the drinking water with the production of the alvine fluxes is by no means so strong as that which attributes typhoid fever to a similar origin. The subject is surrounded by many difficulties, chief among which is the circumstance that other more potent causes of dysentery undoubtedly exist, as shown by the frequent occurrence of that disease at times and places where no fault can be found with the drinking water. Nevertheless, the opinion that impure water may, under certain circumstances, produce alvine fluxes is wide-spread among modern physicians,‡ and I confess I regard it with great favor. If it be true that in some forms of dysentery the discharges from the bowels are contagious, the use of drinking water contaminated with sewage in which such discharges are mingled would certainly offer a ready means for bringing the specific poison into contact with the intestinal mucous membrane of healthy individuals and thus of propagating the disease.

* I refer particularly to the *Report of the Royal Commission on Water Supply*, London, 1869. The commissioners expressed the opinion mentioned in the text in the following striking language: "The organic compounds dissolved in the water appear to be of very instable constitution and to be very easily decomposed, the great agent in this decomposition being oxygen, and the process being considerably hastened by the motion of the water. Now, as such waters always contain naturally much air dissolved in them, the decomposing agent is ready at hand to exert its influence the moment the matter is received into the water; in addition to which the motion causes a further action by the exposure to the atmosphere; and when, as in the Thames, the water falls frequently over weirs, passes through locks, etc., causing further agitation and aeration, the process must go on more speedily and more effectually. The effect of the action of oxygen on these organic matters, when complete, is to break them up, to destroy all their peculiar organic composition, and to rearrange their elements into permanent inorganic forms, innocuous and free from any delcterious quality. This purifying process is not a mere theoretical speculation; we have abundant practical evidence, which we shall hereafter refer to, of its real action in the Thames and other rivers," p. LXXIV, *Report*. See, especially in support of these conclusions, the testimony of PARKES, *Minutes of Evidence*, 3,180 to 3,188, p. 119; HAWKSLEY, 5 076 to 5,083, p. 287; ODLING, 6,451 to 6,462, p. 355; MILLER, 7,088, p. 437, and others. It must be added that, on the other hand, FRANKLAND maintained before the commission that sewage once introduced into water is decomposed with extreme slowness, so that it is very doubtful when it is got rid of, if ever,—6,222 to 6,426, p. 340 *et seq.* Two years later, before the Select Committee on the Metropolis Water (No. 2) Bill—*Special Report, ordered by the House of Commons to be printed*, July 25, 1871—his testimony was still more positive. He declared that sewage once introduced is not got rid of in the Thames, or any river in England, and that "168 miles run would not get rid of above a third of it," *Minutes of Evidence*, p. 103. See, in support of the views of the commissioners, the observations of C. F. CHANDLER—*Water supply of cities*, Reports and Papers presented at the Meetings of the American Public Health Association, in the year 1873, New York, 1875, p. 542—with regard to the water of the Hudson river.

† G. B. WILLSON, letter from, in the Boston Med. and Surg. Jour., Vol. LXVI, 1862, p. 198: "After embarkation, at 10 A. M., on the 17th," (of March, 1862,) "we lay between Washington and Alexandria at anchor till afternoon of the 18th. The water of the Potomac, always muddy and dirty, is at this point pretty well mixed with the drainings of sewers and filth of every kind from Washington, which at the present time, between citizens and other civilians and soldiers, must have a population of over 100,000. This was the only water our men had to drink from the time we embarked, and in less than twelve hours it began to show its effect in diarrhœa and dysentery. Between that time and our landing at Fortress Monroe, I think I must have prescribed for as many as 150 cases of diarrhœa and dysentery, and some 30 or more of our men are yet suffering from the same complaint, contracted or first developed on the boat." A curious supposed cause of water contamination is mentioned by Medical Director Brinton, Appendix to Part I, p. 29, who says of the troops of the Army of the Tennessee at Pittsburgh Landing: "Many of them had been for weeks suffering from the diarrhœa peculiar to the Tennessee River. This is said to result from the large amount of animal decomposition which takes place on the mussel beds or shoals, a few miles above Pittsburgh Landing. Whether this explanation be or be not correct, it is certain that almost every one drinking the water of the river suffered from a profuse diarrhœa which resisted obstinately the ordinary therapeutic means." The above statement, communicated to me verbally by Surgeon Brinton, was mentioned in my *Outlines of the Chief Camp Diseases*, &c., Philadelphia, 1863, p. 212. I have, however, since that time satisfied myself that the opinion is erroneous. In answer to an inquiry addressed to Dr. LAWRENCE SMITH, of Louisville, Kentucky, I have received a letter from General E. KIRBY SMITH, dated March 14, 1878, in which that distinguished gentleman says: "I know of no causes which would tend to make the waters of the Tennessee in the vicinity of the Mussel Shoals laxative in quality. I have waded for days in the Shoals in my conchological trips, drinking freely of the river water, with a tendency to diarrhœa at the time, without having been affected. The inhabitants along the river do not attribute such qualities to the water. From the rapidity of the current and the rocky bottom, the water is in more constant motion, better aerated, and purer than at other points. The mussels are living and healthy. I saw no evidences of impurity imparted to the waters by them; on the contrary, I am convinced they make the water of the river purer and healthier." Dr. J. BERRIEN LINDSLEY, secretary of the Tennessee State Board of Health, in transmitting this letter remarks: "I may add that a similar acquaintance with the mussel beds and shoals on the Cumberland river, fully confirms the views expressed by Professor Smith."

‡ Though usually mentioned by the more prudent rather as a suspicion to be investigated than a fact established, for example, note the caution with which VIRCHOW has expressed himself on this subject—*Kriegstyphus und Ruhr*, Virchow's Archiv, Bd. LII, 1871, S. 30: "Unreines, mit organischen, in Zersetzung begriffenen Stoffen vermischtes Trinkwasser steht mit Recht im Verdacht, sowohl Abdominaltyphus, als Ruhr hervorzurufen." J. B. FONSSAGRIVES—*Hygiène et Assainissement des Villes*, Paris, 1874, p. 296—speaks much more positively: "En ce qui concerne la dysenterie, on n'a plus à démontrer combien l'usage alimentaire d'eaux abondant en matières organiques est susceptible de produire cette maladie;" but he does not cite a single observation in proof, though, when he comes to typhoid fever, a few lines further on, he finds them readily enough.

On the other hand, we may suppose that decomposing animal matters of a non-specific character may, if imbibed with the drinking water in sufficient quantities, give rise to ordinary intestinal catarrhs, which, in accordance with the amount of poison, or the susceptibility of the individual, may or may not assume the characters of dysentery. But all this is to a great extent conjectural, and founded rather upon the analogy of typhoid fever than on actual observations with regard to dysentery. Further investigations, undertaken with special reference to these questions, are much to be desired. Most of those hitherto recorded are loosely made, and few of them will bear even gentle criticism. An outbreak of diarrhœa or dysentery occurs at a particular place, the drinking water happens to be bad, and this is forthwith assumed to be the cause.

But if the fæcal contamination of water is ever a cause of dysentery, certainly the necessary conditions are too often supplied by military camps in time of war. The graphic language of Medical Inspector Summers* shows that, as late as the summer of 1863, the great western army under General Grant had not yet learned the lesson which Moses† taught the Israelites, when he made it a religious duty to bury their excrement beneath the soil; and I know of no reason for believing this particular army to have been less cleanly than the others. Certainly, I myself often witnessed such scenes as Dr. Summers has described, in the vicinity of the camps of the Army of the Potomac, before Washington and on the Peninsula. It is true that army regulations directed sinks to be dug in the vicinity of every camp,‡ and it was generally directed that each day's deposits should be covered with earth. But it was long before the men learned to use the trenches exclusively, and they were too often so badly managed that it was disgusting to use them.§ The brush and timber in the vicinity of the camps usually bore positive testimony to the common neglect of the regulations on this important subject. Where the water supply was derived wholly or in part from shallow surface wells, these were not unfrequently so situated that every rain must have washed into them more or less of the fæcal matter that polluted the soil. Where camp sites were long occupied, additional sources of surface contamination were afforded by the offal of cattle slaughtered for food, which was too often imperfectly buried, and without due regard to any relation between the situation of the place of burial and the wells. The same remark applies to the burial of dead horses, but I believe rarely to dead men, who were, I think, more faithfully and discreetly buried than in any other war of similar magnitude.

That these sources of water contamination exercised, in proportion as they existed, an injurious effect upon the health of our troops I do not for a moment doubt. That this was one of the means of the general spread of typhoid fever is, to say the least, highly probable, in view of well-known facts with regard to the diffusion of that disease by means

* *Supra*, p. 95; and yet in the very same report the writer seems to attribute the ills of these filthy camps to the fact that the water was hard.

† *Deuteronomy*, Chap. XXIII, 12-14: "Thou shalt have a place also without the camp, whither thou shalt go forth abroad: And thou shalt have a paddle upon thy weapon; and it shall be, when thou wilt ease thyself abroad, thou shalt dig therewith, and shalt turn back and cover that which cometh from thee: For the Lord thy God walketh in the midst of thy camp, to deliver thee, and to give up thine enemies before thee; therefore shall thy camp be holy: that he see no unclean thing in thee, and turn away from thee." Our modern trowel-bayonet is well fitted for the office of the Hebrew's paddle, and it is to be hoped will be so used in any future war; meanwhile its aid is said to be occasionally required on the frontier.

‡ *Revised U. S. Army Regulations* of 1861, § 522, 536 and 539. The official directions were: "A portion of the earth dug out for sinks to be thrown back occasionally." Some intelligent officers insisted that this should be done daily, but that proper practice was by no means universal. Compare my remarks on this subject in my *Outlines of the Chief Camp Diseases*, etc., Philadelphia, 1863, p. 49.

§ See also, in this connection, the testimony of O. C. Gibbs, Surgeon 2d N. Y. vols.—Army Correspondence, Med. and Surg. Reporter, Vol. IX, 1862-3, p. 83—with regard to the camp of his regiment near Sharpsburg, Md., in October, 1862: "It is supposed that we are to remain but a short time here, and soldiers go to stool wherever convenience dictates. The consequence is that a stench from fæcal evacuations poisons the whole atmosphere." This regiment of 280 men had 35 to 50 men on sick call daily, nearly all with diarrhœa. So, too, Medical Director McPARLIN reported to General MEADE, June 5, 1861; see Appendix to Part I, p. 161, with regard to the Army of the Potomac near Cool Arbor: "Very few regiments have provided sinks for the men, and their excreta are deposited upon hill sides, to be washed thence into the streams."

of infected water. I suspect also that it was not without its influence upon the spread of the fluxes so common among the troops. In the camps before Yorktown, along the Chickahominy, and in other situations where surface wells were commonly used, their water was very generally accused of producing diarrhœa and dysentery. Several complaints to this effect will be found in Section II.* If this opinion was well founded, I do not doubt that the mischief was done rather by the animal impurities just referred to than by decomposing vegetable matters from the surface. But it would be difficult now to determine the extent of the injury arising from this source, and no analyses were made that can be referred to as showing the extent of the contamination in any particular case.†

*Drinking cold water.*—No discussion of the relation of water to the etiology of dysentery would be complete that did not consider the action of pure water if drunk too cold and in excessive quantities. Long ago, Aretæus‡ mentioned drinking cold water among the causes of ulcerative dysentery, but this opinion was by no means generally shared by the ancient or mediæval writers, and when, in the last century, the learned Ackermann§ discussed the opinion of Aretæus, it appeared to him quite extraordinary. Of late, however, this view has again been brought forward, especially by some of the French writers, Catteloup, Savignac, Dutroulau, Barrallier and Lubrez.‖ It is asserted that, particularly in tropical climates, the ingestion of large quantities of cold water by those who are heated and sweating, as, for example, soldiers on the march, is often followed by cramps, diarrhœa with or without vomiting, or even by dysentery. These results are particularly likely to occur if the ingurgitation of large draughts of cold water is followed by rest in the shade, especially if the surface be simultaneously chilled by a cool breeze; if, on the other hand, the drinker continues his march, or other exercise, he usually escapes. Two explanations have been offered for the accidents in question: The cold drink may simply aid the cool breeze and rest in the shade in producing a sudden suppression of perspiration, with consequent internal congestions; or the direct lowering of temperature in the stomach and adjacent parts, the heat of which is abstracted by the mass of cold water, may produce functional disorders of the solar plexus of nerves, or of the circulation of the abdominal viscera; in either case, the mischief is due to the introduction of a mass of liquid at a low temperature; any other cold liquid, *e. g.*, beer, would act in the same manner.

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* See, for example, the references to this subject by WHITTINGHAM, p. 70; MARTIN, p. 73; STEELE, p. 83; HAPPERSETT, p. 84; GRIMES, p. 86; BACHE, p. 88; and GAGE, p. 93.

† On the general subject of potable waters the reader may consult, besides the works already cited: J. B. FONSSAGRIVES—*Traité d'Hygiène Navale*, Paris, 1856, p. 451 *et seq.*; M. F. HUGUENY—*Rech. sur la Composition*, etc., *des eaux potables*, Paris, 1865; E. D. MAPOTHER—*Lectures on Public Health*, 2d Ed., Dublin, 1867, p. 89; A. BECQUEREL—*Traité Élémentaire d'Hygiène Privée et Publique*, 4me Éd., Paris, 1868, p. 306 *et seq.*; L. PAPPENHEIM—*Handb. der Sanitäts-Polizei*, 2te Aufl., Bd. II, Berlin, 1870, S. 682 *et seq.*; H. BUIGNET—Art. *Eau*, Nouv. Dict. de Méd. et de Chir. Pratiques, T. XII, Paris, 1870, p. 196 *et seq.*

‡ ARETÆUS—*De Causis et Signis Morb. Diut.*, Lib. II, Cap. 9, Ed. Boerhaave, p. 60: The word used is ψυχροποσία, drinking cold water. CELSUS—Lib. IV, Cap. 15—on the other hand, recommends drinking cold water as a cure for dysentery. He declares that it "astringes the ulcers and thereby institutes the beginning of a cure."

§ ACKERMANN—*De Dys. Antiq.*, Leipsic, 1777, pp. 100 and 101: "Hoc vero maxime mirum est, quod Aretæus, qui in enarrandis dysenteriæ caussis maximo pæne inter majores nostros studio elaboravit, frigidæ adeo aquæ infestam vim in creando diro hoc atque hominibus tam molesto morbo accusaverit." He has to express his opinion that ARETÆUS is quite in error, unless his remark be restricted to marsh water or other impure water.

‖ CATTELOUT—*Rech. sur la dys. du Nord de l'Afrique*, Rec. de Mém. de Méd. de Chir. et de Pharm. Militaires, T. VII, 1851, p. 11—pictures the soldier, fatigued by a long march under the sun of Algeria, reeking with sweat, quenching his imperious thirst with the first water he meets. If it is impure, "it is necessarily injurious to the digestive organs, but pure fresh water taken without moderation can itself become a cause of diarrhœa." SAVIGNAC—*Traité de la Dysentérie*, Paris, 1863, p. 45—states the case still more strongly: "The imbibition of a considerable quantity of water, above all when the body is violently heated and in active diaphoresis, a frequent cause of intestinal derangements in all countries, is one which most directly determines dysentery in those where it is endemic." So also DUTROULAU—*Traité des Maladies des Européens dans les Pays Chauds*, 2me Éd., Paris, 1868, p. 561: "If you interrogate patients as to the cause of their dysentery, many will reply that it occurred because they drank cold water while their bodies were heated or sweating;" and a similar opinion is expressed by BARRALLIER—p. 720, *op. cit.*, p. 603, *supra*. For the most recent presentation of this view, see J. M. LUBREZ—*Essai sur l'Étiologie de la dysenterie*, Paris Thesis, No. 297, 1877, p. 17 *et seq.* See also an essay by JULES ARON—*Relation d'une épidémie de dysentérie saisonnière*, Rec. de Mém. de Méd. de Chir. et de Pharm. Militaires, T. XXXIII, 1877, p. 393—who, in describing an outbreak of dysentery among the 4th dragoons at Joigny during August and September, 1876, makes the practice of drinking large quantities of cold water, on returning heated from the military exercises, play a considerable part in the etiology of the disease among the soldiers.

The accidents resulting from this cause were investigated in 1811 by Guérard,* who collected a considerable number of observations in support of his views. According to him, these accidents may be grouped as functional lesions of the nervous system, affections of the digestive apparatus and of the respiratory passages. Under the first head he mentions pain in the stomach, faintness, headache, vertigo, spasmodic phenomena of various kinds, and even sudden death; under the second, symptoms resembling cholera morbus, gastritis, gastro-enteritis, dysentery and peritonitis; under the third, hæmoptysis, pleurisy and pneumonia. Christison† thought it worth while to point out that some of these phenomena may be mistaken for poisoning; an error which indeed led to judicial inquiries in Paris during the hot summers of 1822 and 1825.‡

In the United States accidents of this kind, first alluded to, so far as I can learn, by Franklin, have been described especially by Rush and Watts.§ Here the nervous phenomena particularly have attracted attention; the patients were seized with dimness of sight, vertigo, fell to the ground, breathed with difficulty, the face was suffused with blood, and not unfrequently death ensued. Now I do not doubt in the least that Watts was right when he ascribed the cases he observed not to the cold water drunk but to *coup de soleil;* and, although it would doubtless be going too far to deny all possibility of injurious effects from the copious use of cold drinks, yet I suspect that the majority of the effects they are supposed to cause should properly be attributed to exposure to heat. The sagacious Drake,‖ who accepted from others the opinion that the accidents ascribed to cold drinks in the eastern cities were really produced by them, vainly sought for cases of a similar character in

* A. GUÉRARD—*Mém. sur les accidens qui peuvent succéder a l'ingestion des boissons froides, lorsque le corps est échauffé;* read to the Acad. royale de Méd., November 30, 1811, Annales d'Hygiène Publique, T. XXVII, 1842, p. 13. A learned essay, in which a considerable number of observations by various authors are cited in support of the views maintained. Among others he mentions an incident related by QUINTUS CURTIUS—*De Rebus Gestis Alexandri Magni*, Lib. VII, Cap. 5, Tauchnitz Ed., Leipsic, 1872, p. 283—according to whom, when the army of Alexander, under a burning sun, reached the river Oxus, so many of those who drank intemperately of its water died, that the loss was greater than that general had previously experienced in any battle. I do not, however, with GUÉRARD understand the mortality in this case to have occurred because the water was cold. The army had just marched through a desert in which for some time they had experienced great suffering from almost total deprivation of water. It was its sudden and intemperate use by men who had long been without it that produced the mortality, not merely its temperature. Under such circumstances the sudden free use of drink is almost as dangerous as the free use of food by starving men.

† ROBERT CHRISTISON—*A Treatise on Poisons*, Amer. Reprint of 4th Ed., Philadelphia, 1845, p. 98. He describes particularly the apoplectic and cholera-like cases. The first might be confounded with narcotico-acrid, the second with pure irritant poisons.

‡ See GUERARD—p. 58, *op. cit., supra.* A large number of persons, after swallowing ices and iced drinks in the cafés of Paris during the hot summer of 1825, were attacked by symptoms resembling cholera morbus. Poison was suspected and vainly sought for by chemists appointed by the government. The whole subject was ultimately investigated by a commission of which ORFILA was a member. This body concluded that the accidents were merely due to the sudden action of cold on the stomachs of heated individuals. According to GUERARD similar accidents occurred in Paris in the summer of 1822, which was also very warm.

§ B. FRANKLIN—*On the art of swimming, in answer to some inquiries of M. Dubourg*, Life and Writings, Philadelphia, 1840, Vol. II, p. 182: "I once knew an instance of four young men, who, having worked at harvest in the heat of the day, with a view of refreshing themselves, plunged into a spring of cold water: two died upon the spot, a third the next morning, and the fourth recovered with great difficulty. A copious draught of cold water, in similar circumstances, is frequently attended with the same effect in North America." B. RUSH—*An account of the disorder occasioned by drinking cold water in warm weather, and the method of curing it*, Med. Inquiries and Observations, Philadelphia, 1789, p. 120. "These accidents, he remarks "seldom happen" unless the temperature exceeds 85° Fah. Three circumstances usually concur: The patient is extremely warm; the water is extremely cold; and a large quantity of it is swallowed. A few minutes after swallowing it the patient is affected with dimness of sight, staggers, falls to the ground, breathes with difficulty, his face is suffused with blood, the extremities become cold, the pulse imperceptible, and death ensues in four or five minutes unless relief is obtained. In less severe cases acute spasms occur in the breast and stomach, which are "so painful as to produce syncope, and even asphyxi." Cold punch, beer, and even toddy under the same circumstances, may produce the same effect. The remedy is liquid laudanum. JOHN WATTS, Jr.—*Remarks on the supposed effects of drinking cold water; illustrated by cases which occurred during the hot weather of the summer of* 1818, The Medical and Surgical Register, New York, 1818, p. 81. The cases described, thirteen in number, were all admitted into the New York hospital with symptoms resembling apoplexy. The patients were generally common laborers; some of them recently arrived foreigners: "It was stated that they had been at work, exposed to the sun all the morning, and that they had drunk more than their usual quantity of ardent spirits; that after dinner they returned to their work, and with the additional excitement produced by eating, felt an increasing thirst, which obliged them to go frequently to the pumps, and to drink very largely of cold water." The symptoms which followed resembled those described by RUSH. Two of the thirteen patients died. This occurred during the last two days of June and the first of July, 1818. No rain had fallen for some time, and the thermometer in the shade stood at 92°–93° Fah. Numerous other instances were said to have occurred at the same time in various parts of the city: "It may even be learned that some persons have fallen victims to the injudicious and extravagant administration of laudanum; since it was so frequently recommended, and effectually, too, by the Board of Health," &c., &c. But WATTS judiciously pointed out that these symptoms differ in nothing from those of "coup de soleil" produced by the supposed action of cold water, p. 89 *et seq.;* he insists upon the impunity enjoyed by "the multitudes who, while perspiring at every pore, freely drink large draughts of soda water, much colder than the water of our pumps," and concluding that the cases he describes were not caused by the use of water as was supposed, exclaims, "we feel a moral gratification in vindicating the character of that salutary beverage." Yet these cases are cited by both GUÉRARD and CHRISTISON as illustrations of the noxious effects of cold water.

‖ D. DRAKE—*Principal Diseases of the Interior Valley of North America*, Cincinnati, 1850, p. 661.

the interior valley of the United States, and mentioned that in New Orleans, Mobile and other towns near the Gulf coast, ice was regularly imported from New England, and ice water drunk by multitudes in the hottest weather with impunity.

At the present time the free use of ice water has become so general throughout the United States as to astonish Europeans. Ice-water tanks in the railroad cars, depots and public places of all kinds, as well as in the hotels, bar-rooms and private houses, afford an almost unlimited supply, which is freely indulged in during the hottest weather of our most tropical summers. Iced soda water is exposed for sale in the towns at almost every drug shop and confectioner's store, and so greedily purchased that its manufacture has become a considerable branch of industry. Yet no proportionate multiplication of the accidents which have been attributed to cold drinks has followed; on the contrary, in proportion as a knowledge of the phenomena of heat apoplexy has become more widely diffused, the number of cases in which evil effects are attributed to their reckless use becomes smaller and smaller. So far as diarrhœa and dysentery are concerned, I have never myself seen a case which could be fairly ascribed to the abuse of cold drinks, and think their role in the etiology of these diseases has been very greatly exaggerated.

Alcoholic drinks.—Here the injurious effects of the abuse of fermented drinks as well as of spirits are to be considered. Already Aretæus* mentioned the unaccustomed use of *malt liquors*, and the various beverages employed as a substitute for wine, among the causes of dysentery. In modern times, beer and ale, especially of inferior quality or soured, as is so frequently the case with the stuff furnished to troops by the sutlers in time of war, have been very often accused by military surgeons† of causing diarrhœa and dysentery. But it seems probable that even the excessive use of these drinks, whether of good or bad quality, is seldom of itself to blame. On the other hand, most drinkers of malt liquors will remember occasions, the digestion being already somewhat disordered, when a moderate quantity of good quality has appeared to produce a purgative effect; and in such conditions of the digestive organs excessive draughts, especially if the liquor is bad or sour, would be still more apt to disorder the bowels. Where other causes of diarrhœa or dysentery coexist, the intestinal disturbance thus produced may, of course, initiate serious disease. The various kinds of mead, root beer, cider,‡ and even the non-astringent wines, under like

* Aretæus—*De Causis et Signis Morb. Diut.*, Lib. II, Cap. 9, Boerhaave's Ed., p. 60—specifies in the passage referred to, among the drinks which may thus prove injurious, κυκεὼν, ἢ ῥυτέων πόμα; for the latter expression, the reading βρυτέων πόμα is preferred by Adams in the Sydenham Society's Edition, London, 1856, p. 110. According to Ackermann—*De Dys. Antiq.*, Leipsic, 1777, p. 97—κυκεών or κυκεών πόμα, latinized cocetum, was a sort of thick soup, concerning the composition of which opinions differ, some saying that it was made of wine and flour, others that it also contained cheese and honey. It was rather used as a concentrated food than as a drink. Homer mentions it in several places, *e. g.*, Circe set it before the companions of Ulysses—*Odyssey*, Book X, Lines 233-5 and 290. Concerning the drink ρυτέων or βρυτέων, Ackermann—*op. cit.*, p. 99—states that the name was applied by the Greeks to a drink made by fermenting grape-skins in water, as well as to fermented drinks made from barley, and also drinks prepared from divers herbs and roots. Adams—*op. cit.*, p. 353—translates it "zythus (ale)." The reader may consult on this subject the commentary of Adams on the article Ζύθος in Paulus Ægineta, Lib. VII, Sect. 3, Transl. of Sydenham Society, Vol. III, London, 1847, p. 125, to which I will only add that Dioscorides—Lib. II, Cap. 109 and 110, Paris Ed., 1549—describes the medicinal effects of two kinds of drink made from barley, zythum and curmi, without attributing to either the capability of disordering the bowels.

† The reader will recall that Paul Brand—*loc. cit.*, note *, p. 609, *supra*—mentioned bad beer among the possible causes of the dysentery of the Danish army in Scania, (1677,) and that the dysentery from which Rolander suffered—note ‡, p. 370, *supra*—seemed to be due to the same cause; both these writers imagined that to produce such effects the beer must have contained animal parasites. I will not detain the reader by enumerating the authors who have expressed the opinion that the diarrhœas and dysenteries of soldiers may be due to the abuse of these drinks; a single striking passage from Virchow will suffice. Sketching the various causes which gave rise to fluxes among the German army invading France in 1870, he writes—*Kriegstyphus und Ruhr*, Virchow's Archiv, Ed. LII, 1871, S. 33: "Crowded together in narrow freight cars, provided with no special arrangements for ventilation, the soldiers proceeded almost without interruption hundreds of miles on a stretch. Heated and thirsty they partook indiscriminately of all possible kinds of refreshments offered to them at the stations. All kinds of beer, good and bad, wine, fruit juices and lemonade, fresh fruits, many sorts of bread and meat, coffee, broth, and hundreds of other things were given them and hastily devoured. What wonder, then, that even at this early period so many diarrhœas originated?"

‡ Savignac—*Traité de la Dysentérie*, Paris, 1863, p. 44—is particularly severe in his remarks on cider, which he says is largely drunk in the north of France. He accuses its excessive use of producing the most brutal drunkenness (l'ivresse la plus crapuleuse) and of provoking violent diarrhœa. Even in moderate quantities it may cause brisk purgation. It is especially dangerous if sour. He actually goes so far as to suggest that its general use accounts for the frequency which he assigns to gastric cancer in Normandy!

circumstances may act in the same way. Indeed, similar evil results occasionally follow the use of non-fermented drinks, such as lemonade and other beverages flavored with fruit juices, especially if stale or made of damaged fruits.

The intemperate use of *distilled liquors* has also long been accused of causing dysentery, especially in tropical climates. Annesley and Martin in India, Catteloup in Algeria, Dutroulau writing of the French Antilles, Savignac and Barrallier,* may be mentioned among those who have taught this view. On the contrary, Twining† suggested that the apparent influence of this cause in India is due rather to the fact that intoxicated persons more recklessly expose themselves to the heat of the sun and sudden changes of temperature than to the direct action of alcoholic drinks, and stated that dysentery occurs very frequently in Bengal among persons of the most exemplary temperance. Haspel,‡ from his experience in Algeria, was led to regard the opinion that the abuse of alcoholic liquors is a common cause of dysentery as a very grave error, and pointed out that during epidemics of dysentery it is common for drunkards to imbibe more than usual without being attacked. Sir John Pringle§ expressed the opinion that spirits drunk to excess tend rather to weaken the constitution than to produce any of the common camp diseases. An official statement, published in the Fort St. George Gazette,‖ shows that during the year 1819 the proportion of cases of dysentery among the soldiers in the Madras Presidency who were temperate drinkers was considerably less than among those who altogether refrained from alcoholic drinks or the intemperate; the excess in the proportion of cases among the intemperate as compared with those who practiced total abstinence was very small. The statistics by which this statement is supported cannot be regarded as conclusive, but they are highly

* ANNESLEY—*Dis. of India*, London, 1828, Vol. II, p. 243: "Among the numerous exciting causes of dysentery to which the European soldier is liable in India, there is none whose influence is so marked as indulgence in the intoxicating liquors of the country. The sick-list of a regiment is invariably increased after pay-day, when the men have the means of this indulgence in their power; and the consequence is generally an attack of dysentery, proceeding commonly from the excitement of the mucous surface of the digestive organs, and the derangement of the biliary and other secreting functions, occasioned by these beverages." Sir JAMES RANALD MARTIN—*Influence of Tropical Climates*, 2d Ed., London, 1851, p. 429—sweepingly enumerates "excesses in the use of wine, spirituous liquors or tobacco" (!) among the predisposing causes of dysentery in India. CATTELOUP—p. 11, *op. cit.*, p. 618, *supra*, remarks: "No one can doubt that the immoderate use of these drinks (liqueurs alcooliques) which are often adulterated and drunk without caution, can secondarily produce dysentery." DUTROULAU—p. 563, *op. cit.*, p. 618, *supra*—especially blames the liquor called tafia, produced by distilling the molasses and other waste products of the manufacture of sugar: "This alcoholic liquor is the cause of the death of a multitude of wretches. Its action on dysentery is incontestable." See also SAVIGNAC—p. 43, *op. cit.*, p. 620, *supra*, and BARRALLIER—p. 719, *op. cit.*, p. 603, *supra*. Both these writers particularly blame tafia.

† TWINING—p. 58, *op. cit.*, p. 608, *supra*. ANNESLEY, *loc. cit.*, expresses similar views, but only as one of the modes in which strong drinks produce dysentery: "When the soldier becomes excited by the use of spirituous liquors, he is utterly indifferent to all the consequences of exposure to the direct rays of the sun, to the cold dews and condensed exhalations of the night; and, negligent of the necessary protection from currents of air, and fogs, and rain, he often exposes himself to each of those causes of disease, sleeping sometimes in the open air and upon the damp ground, without any substance intervening sufficient to protect him from the chilling influence of the cold, damp earth on the one side, and the comparatively cold, moist, and unwholesome atmosphere on the other."

‡ A. HASPEL—*Maladies de l'Algérie*, Paris, 1850, T. I, p. 56 *et seq.*

§ PRINGLE—p. 87, *op. cit.*, p. 600, *supra*: "For as to the abuse of spirits, and of fruit, and drinking bad water, however generally they have been accused, I will venture to affirm, that those three causes together never occasioned the tenth part of the sickness of the army, in any of our campaigns. First, as to spirits, it may be observed, that even when drunk to excess, they tend more to weaken the constitution than to produce any of the common camp-diseases; or if some actually sicken after drinking, we may be assured that many more are preserved by taking those liquors in moderation."

‖ I have not obtained access to this journal, and cite from E. J. WARING—*Statistical notes on some of the diseases of India*, Indian Annals of Med. Science, Vol. III, 1855-6, p. 473: "In an Official Return published in the Fort St. George Gazette, Madras, (February 28th, 1851,) are details respecting the influence of intemperance on the sickness and mortality amongst the European troops, serving in the Madras Presidency, during the year 1849. The troops included in this Return, are the 15th Hussars, H. M. 25th, 51st, 84th and 94th Regiments, and the 1st Madras Fusiliers. From this the following Table is collated:—

| DYSENTERY. | Admissions with dysentery. | Deaths from dysentery. | Percentage of admissions to strength. | Percentage of deaths to strength. | Percentage of deaths to admissions. |
|---|---|---|---|---|---|
| 450 Teetotallers | 52 | 3 | 11.555 | 0.666 | 5.769 |
| 4,318 Temperate | 344 | 31 | 7.966 | 0.717 | 9.012 |
| 942 Intemperate | 112 | 15 | 11.889 | 1.592 | 13.500 |

This return tends to show, that too much stress has been laid by some writers on the influence of intemperance on the production of Dysentery, there being very slight difference in the ratio of admission to strength between the intemperate man and the teetotaller. The man who holds the middle course appears to be the least liable to the invasion of this disease."

suggestive, and the attempt of Parkes* to explain them away can by no means be regarded as disposing of the question.

It would be easy, but not profitable, to cite opinions on both sides of the question under consideration. It is a part of the larger question as to the injurious effects of alcoholic drinks on the human frame, which has long been discussed with a degree of bias seldom encountered in scientific discussions, except when the matter in view has also a moral or religious as well as a scientific aspect. On neither side of this question are the opinions advanced so well supported by evidence as to make the opposite view untenable. It is true that the intemperate are often attacked by dysentery, sometimes just after a debauch, and especially in tropical climates; it is also true that perfectly temperate persons are often attacked, especially in tropical climates, and no adequate statistics have been collected to prove which class is most liable. It must be conceded that the absence of such statistics, in view of the moral bias which would make so many persons zealous to collect the facts, if they existed, renders it highly improbable that there is any direct connection between the use or abuse of ardent spirits and the causation of dysentery. And yet it is so well established that habitual intemperance impairs the general health of the drunkard, and that dysentery, when it occurs epidemically, is especially prone to seize upon those whose general health is impaired by any cause, that it is probable that drunkards may be somewhat more subject to attacks during the epidemic prevalence of the disease, and still more so that, as is often alleged, the disease is more fatal to patients of this class, when attacked, than to temperate persons. Moreover, these opinions are in harmony with what we best know of the effects of habitual intemperance upon the health. The fatty or cirrhosed liver so common in old drunkards certainly offers mechanical conditions which may occasion passive congestion of the intestinal mucous membrane, and although this does not of itself give rise to diarrhœa or dysentery, it is undoubtedly favorable to the action of the other causes of those diseases. Moreover, the habitual drunkard is not only more subject to the exposures from which a temperate and prudent person would secure himself, but has less resisting power to oppose to the evil consequences of disease when once established.

Errors of diet.—The relation of errors of diet to the causation of diarrhœa and dysentery has next to be considered. The Greek physicians† laid great stress on the effects of different kinds of food; some relaxed, others constipated the bowels; some were more

* Parkes—p. 285, *op. cit.*, p. 599, *supra*—remarks: "It has been supposed, from some statistics for 1847, published in the 'Fort George Gazette,' that tectotallers were more subject to dysentery, but the error was committed of not estimating sufficiently the influence of a particular station (Secunderabad), where it so happened a number of tectotallers were stationed during an outbreak of dysentery. The conditions of the station were to blame, not the habits of the men." This criticism appears to me highly unsatisfactory: Were there no temperate drinkers or drunkards in the garrison of Secunderabad? I may add that, not having seen the Fort St. George Gazette, I am unable to reconcile the discrepancy between Waring and Parkes as to the date of these observations. Similar statistics collected in other years, and elsewhere, are much to be desired.

† Little bearing directly upon this subject is to be found in the genuine writings of Hippocrates, but much in the spurious or doubtful treatises which have been attributed to him. In *De Victus Ratione*, Lib. II, § 39–56, [Ed. Littré, VI, 535 *et seq.*,] the different articles of food are discussed at length, and several spoken of as relaxing the bowels, producing flatulence, purgation, etc. In the same treatise, § 74, [*Id.*, 615,] diarrhœa and dysentery are particularized among the evil consequences which may follow plenitude resulting from an excess in the quantity of the food as compared with the amount of exercise. In *De Affectionibus*, § 47, [*Id.*, 255,] certain kinds of food are said to cause flatulence, irritation, gripings and loose stools, while others constipate, and elsewhere where cholera and diarrhœa are spoken of as resulting from excess in wine or of the table, § 27, [*Id.*, 239.] In *De Salubri Victus Ratione*, § 7, [*Id.*, 85,] meat diet is said to cause diarrhœa. Galen—*Methodus Medendi*, Lib. VIII, Cap. 5, [Ed. Kühn, X, 571,]—mentions diarrhœas arising from crudities in the aliment, and declares that they sometimes give rise to ephemeral fevers. In *De Probis Pravisque Alimentorum Succis Liber*, Cap. I, [*Id.*, VI, 749 *et seq.*,] he remarks that among the diseases produced by the use of bad food [succi pravi alimentum] during the famines, which for several years had afflicted the nations conquered by the Romans, febrile affections, diarrhœas with offensive acrid stools, dysenteries and tenesmus had prevailed. These diseases especially affected the country people who had been stripped of their best food to supply the towns, and compelled to live on such coarse roots, herbs and other miserable food as they could get. In this treatise the effects of various kinds of food are discussed at length. A still more elaborate discussion of the different articles which may be used for food will be found in *De Alimentorum Facultatibus*, [*Id.*, VI, 453 *et seq.*] Aretæus—*loc. cit.*, p. 620, *supra*—mentions "the administration of acrid things, such as myttôtos, onions by themselves, garlic, food of old and acrid flesh, by which dyspepsia (ἀπεψίη) is produced," among the causes of dysentery—p. 353, Adams' Transl. So also Archigenes—in Ætius, Tetrab. III, Serm. I, Cap. 43, Lyons Ed., 1549, p. 599—affirmed that dysentery might arise from crudities, as well as from unaccustomed and acrid food, (a cruditatibus, perigrenorumque et acrium ciborum acceptione.)

readily digested than others; some provoked flatulency. Indigestible or acrid food, or a mere excess in the quantity of food, might give rise to apepsia and diarrhœa; and protracted diarrhœa was a recognized cause of dysentery. Indeed, the use of indigestible, acrid or bad food is mentioned among the immediate causes of dysentery by Aretæus, Archigenes and Galen. Among the articles regarded as dangerous by Aretæus, cyceon, a thick soup composed of wine, honey, cheese and flour, and myttôtos, an acrid mixture of which garlic and black olives were the chief ingredients, are particularly specified.* These articles of diet, extensively employed in antiquity, have long since gone out of use; but the effect of certain fungi in producing cholera morbus and diarrhœa, insisted upon by Galen,† is confirmed by modern experience, and has recently been investigated by Letellier and Spenceux.‡

The Roman § and Arabian physicians paid no less attention than the Greeks to the effects of particular kinds of diet. There is a striking passage in the Canon of Avicenna,‖ in which it is represented that alvine fluxes may be caused either by a deficiency or excess in the quantity of food otherwise good, as well as by the unwholesome qualities of certain articles of diet. Thus, fluxes are produced by acrid articles such as onions, or by those endowed with venomous properties such as fungi; but special dangers attach to substances that readily putrefy. These are not only themselves prone to become speedily corrupted in the alimentary canal, but when taken with other food communicate to the whole mass their own corruption, and the fermenting contents of the bowel cry out to nature for expulsion from the body. So important did these alimentary causes seem to Avicenna that he devoted a special chapter to the treatment of the fluxes they produce; an arrangement which was long after followed by medical writers.¶

The notion that certain kinds of food are prone to undergo in the digestive canal fermentations of a more putrid character than those which characterize normal digestion had been insisted upon by Galen,** who taught, further, that the same phenomena might result even with wholesome food, if from any cause the digestive processes of the individual were enfeebled; that in these conditions of impaired digestion unwholesome food was

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* With regard to *Cyceon*, see note * to p. 620, *supra*; accordieg to ACKERMANN, *loc. cit.*, it enjoyed the reputation of being a particularly concentrated form of food used to restore the fatigued, and as a first course in feasts. *Myttôtos*, (μυττωτός.) according to ACKERMANN—*op. cit.*, p. 95—was known by the Latins generally as moretum, though it was probably referred to by PLAUTUS—*Mostellaria*, Act. I, Scene 1, Line 45, Tauchnitz Ed., Leipsic, 1869, T. III, p. 88—under the name alliatum. Its composition is given by DIOSCORIDES—Lib. II, Cap. 182, Paris Ed., 1549, fol. 120—who remarks, in treating of garlic: "Factum ex eo, et nigra oliva intritum, quod myttoton vocant." According to ACKERMANN it was used as food chiefly by slaves and rustics, though the better classes sometimes employed it by the advice of their physicians.

† GALEN refers to this subject in several places; I need cite only *De Probis Pravisque Alimentorum Succis Liber*, Cap. 4, [Ed. Kühn, VI 770.] where he declares that of the various kinds of fungi, (μύκητες,) mushrooms (βωλῖται) are not known to have proved fatal, but that even they, when not cooked, sometimes cause cholera. The other fungi have caused death to some persons, and brought others into danger of death by cholera and diarrhœa.

‡ LETELLIER et SPENEUX—*Rech. sur les principes toxiques des champignons*, Annales d'Hygiène, T. XXVII, 1867, p. 71. According to these writers a number of the species of mushrooms are poisonous, the most dangerous being the *hypophyllum cruz militense* of Paulet; of ten victims of poisonous mushrooms, nine owed their death to this. Its administration produces vomiting, pain and diarrhœa, succeeded by cold perspiration, syncope and coma. They found in it two poisonous principles which are identical with those in other poisonous species. The first extracted by water and alcohol, is an acrid non-volatile substance which, when given to cats, produced vomiting, pain, diarrhœa, tenesmus and even bloody stools. The second, extracted from the juice of the plant by a process similar to that used to extract alkaloids generally, is an uncrystallizable substance which acts as a narcotic poison, and resembles narceine in its action. They proposed to call it amanitine, and regard it as a glucoside. Tannin in watery solution is the only antidote, and should be given after, or during the use of oily emeto-purgatives.

§ See, for example, CELSUS, Lib. II, Cap. 19 to 30; note particularly Cap. 28, "De his, quæ facile intus corrumpuntur."

‖ AVICENNA—*Canon*, Lib. III, Fen 16, Tract. 1, Cap. 2, Venetiis, apud Juntas, 1595, p. 809—commences his chapter on the alvine fluxes with the words: "You should know that every flux of the belly results either from the alimentary matters and food ex cibariis et cibis from the surrounding air, or the organs, (ex membris.") Toward the close of this chapter he gives the account of the modes in which the food may cause fluxes, from which I have abstracted the remarks in the text—pp. 812 and 813. With regard to the treatment, see Lib. III, Fen 16, Tract. 2, Chap. 8, *op. cit.*, p. 826. De cura fluxus ventris facti propter cibos. Compare with these passages the remarks of GALEN—*De Sympt. Causis*, Lib. III, Cap. 1, [Ed. Kühn, VII, p. 205 *et seq.*]—on indigestion, the occurrence of crudities, the corruption of the food, the consequent formation of vicious humors and their consequences.

¶ See note to p. 273, *supra*.

** GALEN expresses these views more or less fully in various places, but nowhere more distinctly than in the chapter cited in note ‖, *supra*. To quote from this exposition a single passage, he declares that in interpreting the symptoms which arise from this cause it behooves the physician not only to determine whether indigestion exists, "but also wherefore, whether on account of imbecility of the digestive faculty or on account of immoderate abundance, or of some bad quality of the food," [*Id.*, 212.] Among the consequences to be dreaded, if the conditions referred to are neglected, he especially specifies lientery.

particularly to be dreaded, and that the crudities and vitiated juices arising from these processes were fertile sources of disease. Among the kinds of food which were liable to produce such results, Galen appears to have regarded the seasonable *fruits* of summer and autumn with particular disfavor. It may be conceded that Ackermann,* in his attempt to vindicate the wholesome character of these grateful articles of diet, correctly affirms that neither Galen nor the other ancient physicians anywhere in so many words attribute dysentery to their use; yet it cannot be denied that Galen carried his prejudices against them so far as to declare his belief that they constitute one cause of the great mortality in the autumn which had been insisted upon by Hippocrates.† He seems to have in some way connected their employment with the causation of the autumnal fevers; a notion which Arnold of Villanova, in his commentary on the Regimen of the School of Salerno,‡ extended to embrace the pestilential fevers generally, including small-pox and the other exanthemata. It is true, as Ackermann has correctly pointed out, that Galen himself recommended the use of apples in the treatment of dysentery, and that other ancient physicians, such as Alexander of Tralles, advised damsons, grapes and other fresh fruits for the same purpose.§ But the cautious medical use of this kind of food, which the last-named writer advises on account of its laxative properties, by no means warrants the assumption that its indiscriminate or excessive employment by well persons was believed to be harmless.

Subsequent physicians continued to express the Galenical prejudice against fresh fruits, but came gradually to regard dysentery as the chief evil consequence of their use.

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* ACKERMANN—p. 122 *et seq.*, *op. cit.*, p. 620, *supra*. He relies still more upon the circumstance that "omnes enim pæne medici antiqui sive mala, sive prana, aliosque fructus, qui ad pomorum classem referri solent, iis, qui intestinorum difficultate exercerentur præcepere."

† HIPPOCRATES—*Aphor. III*, 9, [Ed. Littré, IV, 489:] "In autumn diseases are most acute and most mortal on the whole. The spring is most healthy and least mortal," Vol. II, p. 717, Adams' Transl., cited p. 608, *supra*. In his commentary on this passage GALEN—*Comm. III in Aphor. Hippoc.*, § 9, [Ed. Kühn, XVII, B, 576,]—explains the autumnal mortality by saying that at this season it is both hot and cold during the same day; that it follows the summer heat by which the strength of men has been prostrated; that its chill air drives back the humors which were tending to the skin, and that, besides such causes which are common to all, the autumnal fruits are abundantly offered to those who will use bad diet, and that depraved humors accumulate in such persons who use them freely. In *De Alimentorum Facultatibus*, Lib. II, Cap. 2, [Ed. Kühn, VI, p. 560,] he explains that the perishable nature of the summer fruits favors their fermentation in the digestive organs, and that they are all to be regarded as unwholesome, "sunt autem omnia hæc pravi succi," and in another chapter of the same treatise—Cap. 6, [*Id.*, 569,]—he counsels abstinence from them, for the unwholesome humors which they generate may accumulate in the veins, and there putrefying occasion malignant fevers. These passages must satisfy even those who are unwilling to admit the authenticity of the treatise *De Probis Pravisque Alimentorum Succis*, Cap. 1, [*Id.*, 755 *et seq.*,] in which GALEN relates that he himself frequently suffered from febrile attacks, requiring bloodletting, in the autumn in consequence of his free use of summer fruits, was once in danger of an abscess between the diaphragm and the liver from the same cause, and that he only enjoyed habitual good health after he resolved to refrain from them. He adds that he had persuaded a number of friends to follow his example, with equal benefit to them. PAULUS ÆGINETA—Lib. I, Cap. 53, Transl. of Adams, printed for Sydenham Soc., Vol. I, London, 1844, p. 73—states the objection to fruits somewhat more moderately when he says that in autumn "too much fruit ought likewise not to be taken, being hurtful not only by the quantity, but also by the quality of the chyle which it supplies, and by engendering flatulence."

‡ ARNOLDUS DE VILLANOVA (died, 1313)—*Commentum super Regimen Salernitanum*, Opera Omnia, Basel, 1585, p. 1907. The old verse ran: "Autumni fructus caveas, ne sint tibi luctus," "Take care of autumnal fruits lest they be a sorrow to thee." On which he comments that grapes, peaches, figs and the like engender blood that is prone to putrefy, especially if they be received into an unclean stomach and a body full of ill humors such as generally occur in autumn, and thence ill diseases are engendered, such as small-pox, morbilli and pestilential fevers. There is a curious English translation (not very accurate) of this commentary entitled *The Schoole of Salernes most learned and juditicus Directorie*, &c., London, 1617. HÆSER—*Lehrb. der Geschichte der Med.*, Bd. I, 2te Aufl., Jena, 1868, S. 284—thinks the common opinion probable that the Regimen of the School of Salerno was addressed to Robert, son of William the Conqueror, who visited Salerno for the treatment of a wound in 1101.

§ ACKERMANN—p. 123, *op. cit.*, p. 620, *supra*. GALEN—*De Alimentorum Facultatibus*, Lib. II, Cap. 21, [Ed. Kühn, VI, 597,]—says that apples may be given with bread for the purpose of strengthening the digestive organs of those who have but little appetite and digest slowly, as well as those who suffer from vomiting, diarrhœa and dysentery. For these purposes he recommends particularly those apples which possess a certain degree of astringency. On the other hand, ALEXANDER of TRALLES—Lib. VIII, Cap. 9, Basel Ed., 1556, p. 458-9—recommends laxative fruits. The passage referred to relates to the treatment only of the variety of dysentery in which the ulcers are seated in the rectum. For this he advises a regimen intended to keep the stools soft and unirritating. He declares that he has known persons to be cured by the abundant use of damsons or grapes; but he cautions against the unnecessary use of such articles of diet on account of their tendency to fermentation. ACKERMANN—p. 125, *op. cit.*, *supra*—relates, in support of his interpretation of the views of this author, an anecdote in which he is represented as giving fruit freely in an acute bilious disease epidemic in Rome; ("bilioso morbo acuto grassante;") but in fact, the disease in question was simply tertian intermittent fever, and the observation referred to has no direct bearing on the dysentery question. It will be found in the chapter in which ALEXANDER of TRALLES treats of tertian fever—Lib. XII, Cap. 6, Ed. cited, p. 733. He relates that he often administered fruits and vegetables of various kinds, especially pompions, (πεπόνες,) with advantage just before the commencement of the paroxysms, but that most of the Roman physicians never even named them except as generators of bile. On one occasion, after he had prescribed pompions to a patient laboring under this fever, a physician who stood by exclaimed: "Man, why do you wish to kill rather than cure this sick person? Read GALEN on Aliments, where he clearly says that eating pompions makes people bilious." He then says that he was at much trouble to explain to those who could understand him, that GALEN did not say that pompions generated bile, but that they caused cholera, (cholera morbus,) that is vomiting, and goes on to express his own opinion that they do not even have this effect if moderately used. The passage in GALEN referred to will be found in *De Alimentorum Facultatibus*, Lib. II, Cap. 4. [Ed. Kühn, VI, 564.]

Fabricius Hildanus* very clearly sets forth the reasoning upon which this opinion was based when he declared that the season of autumn, in which these fruits abound, is also that in which experience, as well as Hippocrates, shows that dysentery chiefly prevails. It would be unprofitable to multiply citations in illustration of the extent to which this opinion found acceptance. For a long time it encountered no serious opposition. It was acknowledged that the use of fruits in excess, especially if unripe, was a common cause of diarrhœa and dysentery, even by those who, like Sennertus,† correctly held that it was not the exclusive cause of these diseases, and pointed out that dysentery occurs also among infants at the breast and grown persons who never use fruit, and that it may prevail as an epidemic in the spring before fruits make their appearance.

The first whose protest against this general belief secured a favorable hearing from medical men was undoubtedly Degner,‡ who based his opinions as much upon unfounded speculative reasons as upon the observations he brought forward to show that fruits may be freely indulged in without danger, and that, although their abuse may give rise to simple diarrhœa, it is not chargeable with the production of dysentery. His speculations did not long survive, but his observations were confirmed by others, and the innocence of fresh fruits, so far as the causation of dysentery was concerned, was affirmed by Sir John Pringle, Tissot, Zimmermann, Donald Monro and many others.§ Tissot relates that a regiment of Swiss, stationed in southern France, having been attacked by dysentery, the

* G. FAB. HILDANUS—*De Dysenteria*, (1602,) Opera, Frankfort, 1646, p. 670—"Experientia enim docet, uti quoque Hippocr. et alii scriptum reliquerunt, autumni tempore, cum hujusmodi fructus maturescunt, dysenteriam inprimis grassari." But he gives an explanation of the mode in which they act, which is quite consistent with the Galenical teachings when he declares that they do mischief, "quia facile corrumpuntur, et in humorem causamque morbificam dysenteriæ convertuntur." HILDANUS gives *(loc. cit.)* quite a list of authorities to whom he appeals in support of these views; but an examination shows that he has confounded together the more ancient writers who declare autumnal fruits injurious, and the more modern ones who say that they produce dysentery.

† SENNERTUS—*Pract. Med.*, Lib. III, Pars II, Sect. 2, Cap. 7, Opera, Paris, 1641, T. III, p. 125—names, in a general way, among the causes of dysentery, "such a nature of the food and things swallowed that they can be readily converted into nerid and eroding humors, (humores neres et mordaces.)" He admits that the common opinion is right, that fruits, especially if not ripe, belong to this class, "cum experientia doceat, multos ab esu fructuum et prunorum, aucum, avellanarum et similium, præcipue non satis maturorum in dysenteriam incidisse." Yet he declares his belief that the cause of dysentery ought not always to be referred to the use of such fruits, since even those who altogether abstain from them have fallen into dysenteries. Then he adds the noteworthy observation that the epidemic dysentery of 1624 began in some of the towns in the neighborhood of his practice in the month of May, before there was any fruit at all, and greatly diminished, or altogether disappeared, towards the close of autumn, when all the fruits were ripe and in daily use. Moreover, during the same epidemic he himself treated dysenteries afflicting suckling infants and persons who wholly abstained from the use of fruits. SENNERTUS had a special prejudice against eating grapes and drinking must, for which he gives the following reasons: "Nam non solum fermentationem in humoribus excitant: verum sæpe etiam ex nebulis, rubigine et carbunculo, arancis, aliisque vermibus multa inquinamenta uvis et musto insunt, quæ humores inficiunt et concitant, ut diarrhœæ et hinc dysenteriæ causæ sint, præsertim si corpus dispositum sit."

‡ Others had previously taken the same ground, but without securing a general hearing. Thus, PETER ROMMEL—*Dysenteria contumax uvis recentibus et musto curata*, Ephem. German., Dec. II, Ann. I, Obs. 192, p. 370—after relating a case of dysentery which was cured by the diet SENNERTUS accused of causing the disease, viz: eating grapes and drinking must, declared that common experience shows that fruits of all kinds, cucumbers, plums &c., are eaten daily and in abundance without any injury whatever to the health. And SAM. CARL—*Spec. Theor. Med.*, p. 267, cited by DEGNER, *loc cit., infra;* I have not been able to see the original—had pointed out that in vintage time the intemperate use of grapes occasionally causes diarrhœa, but is never known to produce dysentery. DEGNER—*Hist. Med. de Dys. Biliosa Contagiosa*, &c., (1728) Ed. novissima, Utrecht, 1754, p. 248—thought that the acid fermentation of the fruit was so contrary in its nature to the alkaline fermentation which he supposed to arise from the miasma that produces dysentery ("ortæ e miasmate bilioso-dysenterico") that it could not possibly cause that disease: a similar suggestion had been already made by ROMMEL, *loc. cit.* DEGNER cites the observations of ROMMEL, CARL and some others, confirms them by his own, and declares: "Summer fruits sweet, fresh and ripe do not readily injure anybody, but, rather on account of their friendly vegetable acid, are most grateful to our systems, and truly a divine gift to those who rightly use them."

§ PRINGLE—*Obs. on the Dis. of the Army*, 1st Ed., London, 1752, p. 24—observed in 1743 that the dysentery appeared earlier than usual among the English troops in Flanders, and remarked: "Now, as its usual time is not before the latter end of summer, or beginning of autumn, its cause has been unjustly imputed to eating fruit in excess. But, the circumstances here contradict that opinion; for the sickness began and raged before any fruit was in season, except strawberries, (which, from the high price, the men never tasted,) and ended about the time the grapes were ripe; which growing in open vineyards were eat by every body." In another passage—p. 109 *et seq.*—he cites DEGNER, and adopts his theoretical explanation of the innocence of fruit in this connection. TISSOT—*Avis au peuple sur sa santé*, (1761,) Chap. 21, § 338, Œuvres, T. III, Lausanne, 1788, p. 13—says that unripe fruit may sometimes occasion diarrhœa, constipation, diseases of the nerves and of the skin, "but never an epidemic dysentery. Ripe fruit of any species, especially summer fruits, are true preservatives against this disease." He relates several striking incidents in support of his opinion, among them the one mentioned in the text. J. G. ZIMMERMANN—*Von der Erfahrung in der Arzneykunst* Theil II, Zurich, 1764 Buch IV, Cap. 6, S. 255 *et seq.*—repeated the opinion of TISSOT as to the injury that unripe fruit might do: "Aus dem Misbrauch des rohen Obstes entstehen Herzweh, Colliken, Durchfälle, Verstopfungen und allerley Nervenkrankheiten," but insists that it cannot produce dysentery; he cites DEGNER in support of the latter opinion. The subsequent experience of ZIMMERMANN during the epidemic of 1765 confirmed him in these views: see *Von der Ruhr unter dem Volke im Jahr 1765*, Zurich, 1767, Cap. III, S. 37 *et seq.*, for the statements made in the text. He also mentions—*op. cit.*, Cap. VI, S. 128 *et seq.*—that during the epidemic of 1765 fresh grapes liberally administered proved an excellent remedy for dysentery. DONALD MONRO—*An Account of the Diseases which were most frequent in the British Military Hospitals in Germany from Jan., 1761, to the return of the troops to England in March, 1763*, London, 1764, p. 58, note—speaks of the opinion that fruit causes dysentery as a "vulgar error," and cites PRINGLE and TISSOT.

officers purchased the crop of a vineyard for the men, and thus presently cured the sick and preserved the well from the disease, which speedily disappeared. Zimmermann, in the epidemic of 1765, saw dysentery appear among the poor in the month of June, when, indeed, the early cherries were ripe, but much too dear for them to buy, and he observed that that year fruit was unusually scarce; while Tissot had previously shown that there was but little dysentery during 1759 and 1760, years in which fruit was unusually abundant.

Since the commencement of the present century, although from time to time the excessive use of unripe or spoiled fruit has been accused of at least irritating the bowels and favoring the occurrence of dysentery in the predisposed, or during the epidemic prevalence of the disease, most of the physicians who have particularly examined the subject express views which agree substantially with the observations of Degner.* Trousseau† has contributed an observation not unlike that recorded by Zimmermann. In the year 1859 France was visited by a severe epidemic of dysentery; during that year fruits were quite scarce, while in 1858 they were extraordinarily abundant and dysentery was very rare.

In the course of our own civil war it was found that, so far from the use of fresh fruits or vegetables favoring the production of diarrhœa or dysentery, it manifestly diminished the frequency and severity of the diseases. Medical officers report that when fresh vegetables were issued to the troops, or obtained by foraging, the number of soldiers on sick report with fluxes promptly diminished, and that the same result was observed when the men had an opportunity to plunder orchards and vegetable gardens or even to pluck green corn in the fields.‡ Undoubtedly what happened in these instances was partly due to the fact that a wide-spread scorbutic taint existed among our troops, so that the fruits and vegetables owed their beneficial influence to their antiscorbutic virtues. Nevertheless,

* Thus, for example, A. A. MALIK—*Abhandlung über die Ruhr*, Prague, 1828, S. 40—while he admitted that the use of ripe fruit is often not injurious, even that many physicians have employed it in the treatment of dysentery with benefit, held that unripe fruit is often a cause of the disease, and declares that during the epidemic of 1827 on the Nawarow and Jesseney estates it particularly attacked children who ate wild berries: "Dass diese Beschuldigung aber auch zum Theil anerkannt werden müsse und wahr sey; zeigen meine Beobachtungen, dass sie am leichtesten bei jenen Kindern sich einstellte, die sich viel in Wäldern aufhielten, und übermässig viel Waldobst, als Heidel-, Preissel- und Brombeeren genossen." NAUMANN—*Handb. der med. Klinik*, Bd. IV, Abth. 2, Berlin, 1835, S. 38—brings forward this observation in support of his opinion that overloading the stomach with green, sour or unsound fruit "acts injuriously upon the intestinal canal, and at least is able to favor the predisposition to dysentery," and remarks: "Aus diesem Gesichtspunkte vermag der Genuss mancher Obstarten, z. B. der halbreifen Birnen, der Pflaumen und Stachelbeeren, als Schädlichkeit einzuwirken." VIRCHOW—*Hist. etc. zur Lehre der Unterleibsaffektionen*, Archiv, Bd. V, S. 350 *et seq.*—maintains the danger of the use of unripe fruit, or of any fruit under certain conditions, remarking that he himself has repeatedly seen fatal dysentery result from the thoughtless use of fruit during convalescence from typhoid fever. BARRALLIER—p. 718, *op. cit.*, p. 603, *supra*—remarks: "We do not completely adopt the opinion of Zimmermann, for it is evident that, if acid fruits under ordinary circumstances can only be accused of provoking diarrhœa, they may become injurious in the course of a dysentery." He thinks, however, that the saccharine (mucoso-sucrés) fruits are perfectly harmless. More moderate views are expressed by BAMBERGER—S. 395, *op. cit.*, p. 578, *supra;* SAVIGNAC—p. 42, *op. cit.*, p. 620, *supra;* DUTROULAU—p. 563, *op. cit.*, p. 618, *supra*, and many others: yet perhaps the majority of modern writers express themselves with caution as to the safety of unripe and bad fruit or condemn it altogether, and several, as SAVIGNAC, for example, think it best to avoid acid fruits during the endemic or epidemic prevalence of dysentery.

† TROUSSEAU—*Considérations clin. et thér. sur la dyssenterie*, (reported by Legrand du Saulle.) Gaz. des Hôpitaux, An. XXXIII, 1860, p. 37; see also *Clinique Méd. de l'Hôtel-Dieu de Paris*, 2me Éd., Paris, 1865, T. III, p. 159.

‡ See, for example, in Section II, the remarks of CALHOUN, p. 73; FORBES, p. 74; and HAMILTON, p. 96. CALHOUN has elsewhere—*Rough notes of an army surgeon's experience during the great rebellion, No.* 15, The Med. and Surg. Reporter, Vol. IX, 1862-3, p. 424—related more fully his experience with regard to the benefits obtained by the second division, 3d Corps, in August, 1862, from the free use of green corn roasted: "That diarrhœas and dysenteries ceased, as if by magic." So also Medical Director J. F. HAMMOND, of the 2d Army Corps—Appendix to Part I, p. 65—says of the diarrhœa which prevailed in the Army of the Potomac on the Peninsula: "A surgeon of brigade reported to me that he had cured some of his cases of diarrhœa with raw Irish potatoes in vinegar." J. C. HUBBARD, Surgeon 41st Ohio volunteers—*Sanitary report*, Cincinnati Lancet and Observer, Vol. V, 1862, p. 527—states that during the summer of 1862 camp diarrhœa in his regiment "was often relieved by the free use of berries and other subacid fruit, and I am of opinion that the improvement of the health of the men in this respect is attributable to the comparatively free access we have to these fruits and fresh vegetables since our arrival to the richer and better cultivated region of North Alabama." S. K. TOWLE, Surgeon 30th Massachusetts volunteers—*Notes of practice in the U. S. A. General Hospital, Baton Rouge, La., during the year* 1863, Boston Med. and Surg. Jour., Vol. LXX, 1864, p. 59: "During the early fall of 1862, I had a large number of serious cases of chronic diarrhœa, many of them exhibiting symptoms of scurvy. The only vegetables within my reach, in any considerable amount, were green oranges; and, as they were very grateful and palatable to the taste of the patients, I bought with my hospital fund large quantities of the fruit, and soon became convinced that few articles of medicine or food did as much good." A. D. OSBY—*On the use of large doses of calomel in diarrhœa and dysentery*, Atlanta Med. and Surg. Jour., Vol. VIII, 1867-8, p. 155—relates his experience with the camp diarrhœa of the 17th Kentucky volunteers, 1862, as follows: "The chronic cases on hand, when I joined the regiment, that did not recover during the spring, were cured by green corn in the summer, without any further medication. The green corn was scraped from the cob and boiled done in water, a piece of fat pork being thrown in to season it. Thus the regiment was delivered from that terrible army scourge." On the other hand, unripe fruits, vegetables, etc., are mentioned among the causes of camp diarrhœa by several reporters in Section II: *e. g.*, CHAMBERLAIN, p. 67; BARKER, p. 68; PERRY, p. 70; VOLLUM, p. 71; REAMER, p. 78; TAYLOR, p. 87; TUTTLE, p. 90; and BIDWELL, p. 96.

such observations are in harmony with those which show the innocence of fresh fruit under circumstances in which scurvy can have played no part, and the old experience of Alexander of Tralles* finds a parallel in the successful treatment of summer fluxes with watermelons and peaches by some of the New England physicians during 1869.† To explain such observations it is by no means necessary to deny that indigestion, vomiting or diarrhœa may at times be produced by the excessive use of green or spoiled fruit. But the dangers from this source are altogether insignificant when compared to the benefits to be derived from the proper use of this kind of food even under ordinary circumstances, and especially in the case of armies in times of war, when so many conditions conspire to favor the development of a scorbutic taint among the troops.

More serious dangers attach to the use of *animal food* in which, from imperfect methods of preservation or length of keeping, *putrefaction has fairly commenced.* Spoiled oysters, lobsters, crabs and fish are particularly obnoxious, but spoiled meat, whether fresh or salted, produces similar effects with an energy corresponding to the degree to which putrefaction has advanced and the resisting powers of the individual.‡ The effects vary from simple vomiting and purging to a brisk gastro-intestinal catarrh which, in extreme cases, may be accompanied by a cholera-like collapse. The severer forms of these accidents are, however, comparatively rare, because such decomposed animal food appears to most persons so revolting that they refuse to swallow it.

An illustration of the production of diarrhœa by the use of food in which putrefaction had commenced was afforded during the year following the war by the so-called Horsford marching ration,§ which consisted essentially of parched wheat in lieu of bread, and a

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* See p. 624, *supra.*

† See the articles entitled *Watermelon vs. Diarrhœa*, Boston Med. and Surg. Jour., Vol. IV, 1869, by S. G. WEBBER, p. 34; C. E. BUCKINGHAM, who recommends peaches also, p. 73; H. C. BICKFORD, p. 116; and B. E. COTTING, p. 146. The last writer reports nine cases of cholera morbus and acute diarrhœa treated successfully by the free use "of the pulp of ripe watermelons."

‡ I will not attempt to go into the literature of this subject, but refer the reader to the work of R. CHRISTISON—*Treatise on Poisons;* I cite the 1st Amer. Ed., Philadelphia, 1845, Part II, Chaps. 23 and 24, p. 477 *et seq.*—for a pretty good introduction to the earlier observations. He treats quite fully of poisonous mussels and oysters, and of poisoning by diseased and decayed animal food: "These poisons are formed in three ways, by morbid action local or constitutional, by ordinary putrefaction, and by modified putrefaction," p. 487. The symptoms described are vomiting, purging, &c. See also WHARTON and STILLÉ'S *Medical Jurisprudence*, 3d Ed., Vol. II, Philadelphia, 1873, § 535–6, p. 482 *et seq.*, and A. S. TAYLOR—*On Poisons*, 3d Ed., London, 1875, Chap. 54, p. 532 *et seq.* Already, in the last century, G. VAN SWIETEN—*Kurze Beschreibung und Heilungsart der Krankheiten welche am öftesten in dem Feldlager beobachtet werden*, Vienna, 1758, S. 107—declared that camp dysentery arises when the troops eat meat or fish beginning to putrefy, or mouldy bread, or bread made from mouldy flour, ("geschimmeltes, oder von geschimmelten Getraid gemachtes Brod.") A translation of this little work by JOHN RANBY, Surgeon General to the British Army, was reprinted in America, Philadelphia, 1776, for the use of the Continental medical officers during the Revolutionary War.

§ Prof. E. N. HORSFORD, formerly Rumford Professor in Harvard University, Mass., has the credit of having devised this "Marching Ration," and secured its trial by persistent and ingenious representations of its value, in spite of the unfavorable report of a board of officers to whom the question of its adoption was referred. In a communication to the Secretary of War, dated Jan. 23, 1865, he especially claimed for it that it was "more palatable, more healthful, less perishable and less expensive than the existing marching ration." Indeed, he went so far as to assert in another part of the same communication "that it is substantially imperishable." Feb. 18, 1865, the Commissary General was directed by the War Department to purchase 500,000 of these rations for trial. In a communication to the Commissary General, dated March 15, Prof. HORSFORD explains that his "bread ration consists of ninety parts of roasted wheat coarsely ground, ten parts of finely crystallized, not powdered, white sugar and a trace of salt to each hundred parts. Eight ounces avoirdupois is a day's supply." The price charged for this ration of 8 oz. was 8½ cents per ration. In the same communication Prof. HORSFORD adds: "The meat ration I call 'roasted whole beef.' It is cooked by coagulating by dry heat the albumen at the surface of the individual mouthfuls into which the total lean meat is cut. It includes in addition to the mass of lean meat ordinarily served, the liver, heart, tongue, and kidneys, together with the meat and nutritive juices detached and extracted from the raw bones of the entire carcass, and the juices of the scrap lean meat adhering to the lump fat. The juices are carried down in vacuo, the lean meat all roasted, and dried down till the pieces are fixed, leaving still about one-fifth of the water of the normal lean meat, the former incorporated with the latter, and with the seasoning resolved into a homogeneous whole of small mouthfuls. These are pressed into forms and varnished with gelatine. * * * Each ration will weigh about three ounces, and occupy about four cubic inches, and be the full nutritive equivalent of ten ounces of first class fresh lean beef." The price charged for the ration of three ounces of this material was 33 cents. These rations, delivered to the Commissary at New York, were ordered by General GRANT to be placed in depot at New Orleans, subject to the orders of General SHERIDAN, for use in the department of Texas. They were actually shipped from New York at various dates between May 25 and July 1, 1865, and having been received by Col. M. P. SMALL, the commissary on duty at New Orleans, portions were sent by him to different parts of Texas during July, August and September, and earnest efforts were made to secure their use by the troops. But the "substantially imperishable" ration had already begun to undergo putrefactive changes. The soldiers for the most part refused to eat it, and those who were induced to make the attempt not merely found it disagreeable in taste and insufficient in quantity, but suffered from diarrhœa produced by its use. Capt. H. F. HAWKES, post commissary at Ringgold Barracks, Texas, reported to Col. SMALL, Nov. 5, 1865: "Captain LEWIS informed me that on being issued to the troops at Edenburg it produced diarrhœa. * * * Of that sent to Rome, a portion was issued to the troops by Lieut. JOHNSTON until its issue was forbidden by Surgeon EAGLE, Medical Director and Inspector of the 2d Brigade, 2d Div., 25th A. C., as diarrhœa was becoming so prevalent that the hospital was filled with patients." He adds that some of the cases containing these rations were inspected and condemned as "mouldy, rotten, and unfit

special form of compressed beef. A large quantity of this food, purchased in the spring of 1865, was sent to the commissary depot at New Orleans for issue to the troops serving in the department of Texas, where it arrived during the summer of the same year. The parched wheat soon spoiled and became full of vermin; the beef underwent putrefactive changes, and, as a consequence, the marching ration was tried to but a limited extent. When actually used it produced diarrhœa, and this result occurred not only when the whole ration was eaten, but in some instances followed the employment of the spoiled parched wheat only. That greater mischief did not occur appears to have resulted from the refusal of the troops to use this putrid food to any very great extent.

In connection with the injurious effects of damaged animal food I may refer to the consequences of the use of meat containing the trichina spiralis. Such food is well known to produce violent gastro-intestinal catarrhs with other serious symptoms.* It has been suggested that this cause may have played an important part in the production of intestinal fluxes during the civil war,† but I know of no observations showing that this was actually the case. In this place, also, may be mentioned the attacks of vomiting and purging that occasionally follow the use of cheese, and are sometimes so violent as to give rise to suspicions of poisoning. In November, 1864, Surgeon F. V. Hayden, U. S. Volunteers, forwarded to the Surgeon General's Office for chemical examination a large piece of cheese from which a distinguished general officer and his staff had eaten freely at dinner, and which, from the violence of the vomiting and purging produced, was believed to be poisoned. A careful chemical examination by Dr. B. F. Craig showed the error of this view.‡ The exact conditions under which cheese assumes this poisonous character and the nature of the changes that occur are as yet unknown.§

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for issue. To be buried immediately and dropped from the returns." In an endorsement, dated Nov. 28, 1865, Col. SMALL remarks: "Similar reports from different points in this military division have been received regarding the condition and issue of this peculiar ration, all of the same tenor, viz: the meat rotten and mouldy, the bread filled with weevil and worms and unfit for issue. The Horsford meat and bread ration on hand at this depot, in a dry storehouse, and not exposed to the weather either by transportation or otherwise, was found upon examination to be unfit for issue, and the following is the report made: Inspection report: Condition of meat ration 'mouldy, rotten, and totally unfit for issue to troops; if possible, to be sold, otherwise to be thrown away or buried. Bread ration is full of weevil and other worms, should have been packed in air-tight tin cases; to be sold, as it is only fit to be fed to hogs or cattle.'" The quantity thus condemned at New Orleans, Nov. 13, 1865, was 127,500 of the bread rations, 129,200 of the meat rations. Surgeon D. MACKAY, 29th U. S. colored troops, writes, Nov. 13, 1865, that as post surgeon at Ringgold Barracks he had "the Bread ration tested to its fullest extent. In no case have I known it to produce anything but injurious results. It is perfectly inadmissible in affections of the alimentary canal." Surg. BENJ. DURHAM, Jr., U. S. Vols., Chief Med. Officer 3d Div., 25th Army Corps, writes, Nov. 15, 1865, to the commissary at Brazos Santiago, Texas: "I decidedly protest against any attempt to issue this beef to the troops, for you will find it spoiled, and I recommend that it may be immediately removed from your storehouses lest it should disadvantageously affect other desiccated rations. I also request, if this is condemned, that (as a sanitary measure) it be taken out in a lighter and thrown into the gulf. Unless properly buried it should not be left on the island." Asst. Surgeon O. F. ROGERS, 117th U. S. colored troops, writes from Ringgold Barracks, Dec. 7, 1865, that the Horsford bread ration "produces colic and diarrhœa in a great proportion of the men." Capt. CHAS. H. MORSE, 117th U. S. colored troops, writes, Dec. 9, 1865, of the bread ration: "In my own case, and in the case of the men of my company, it produced diarrhœa." Asst. Surgeon B. HOBBS, 116th U. S. colored troops, reports, Dec. 8, 1865, that during the few days that Horsford's marching ration was issued under his observation, "there was a great increase of sickness in the command," especially of "bowel derangements." The unfortunate results of this experiment are well calculated to suggest caution to future aspirants in the same direction.

* On the subject of the trichina spiralis, see F. KÜCHENMEISTER—*On Animal and Vegetable Parasites of the Human Body*, Transl. of Syd. Soc., London, 1857, Vol. I, p. 333 *et seq.*; C. DAVAINE—*Traité des Entozoaires*, Paris, 1860, p. 672 *et seq.*; T. SPENCER COBBOLD—*Entozoa*, London, 1864, p. 334 *et seq.* The last two authorities may be especially consulted for the literature of the subject.

† GEORGE SUTTON—*A report on trichinosis as observed in Dearborn Co., Indiana, in* 1874, Trans. of the Indiana State Medical Society, 1875, p. 126—after referring to the mortality among our troops during the civil war from intestinal fluxes, remarks: "When we take into consideration the imperfect manner in which meats are often cooked in the army; the hurried manner in which the meals are prepared and eaten—meat often eaten almost raw during the excitement of battle—the large amount of pork which enters into the rations of the soldiers, with the gastro-enteritis which trichinous pork is known to produce, it makes it more than probable, we think, that many of these cases of diarrhœa and dysentery arose from trichina."

‡ Dr. CRAIG, then chemist of the Surgeon General's Office, reported, November 14, 1864: "I do not find in the cheese any of those mineral poisons whose presence would account for the effects produced by it, but from its taste and smell I believe it to have entered into a peculiar condition of putrefaction which is known to occur in cheese and to confer upon it poisonous properties."

§ On this subject PARKES—p. 219, *op. cit.*, p. 599, *supra*—remarks merely: "Sometimes cheese becomes sour, particularly if made from sheep's milk, and may cause diarrhœa." L. PAPPENHEIM—*Handb. der Sanitäts-Polizei*, 2te Aufl., Bd. II, Berlin, 1870, p. 71—states that the so-called cheese poison ("Käsegift") occasionally develops in the most unaccountable way in the whole product of cheese factories, which for years have been producing a wholesome article. In such a case brought to his own notice, he searched in vain for any known poisonous substance which might have been accidentally introduced during the process of manufacture. He suggests that some microscopic fungus developed in the cheese may be the cause of the trouble; (see also S. 451;) but this is a pure speculation, for which there is no evidence whatever. See, for an introduction to the older literature of the so-called poisonous cheese, CHRISTISON—Part II. Chap. 24, p. 494 *et seq.*, *op. cit.*, note ‡, p. 627, *supra*; also WHARTON and STILLÉ, § 534, p. 481, and TAYLOR, p. 534; both cited in the same note.

In a general way it must be admitted that the ingestion of large quantities of any food difficult to digest may give rise to vomiting or diarrhœa. But here the condition of the individual is often more important than the character of the food, for that which is readily disposed of by robust digestive organs is often wholly unmanageable by individuals whose digestive organs are for any reason impaired.

Two articles of the army ration issued to our troops, hard bread and beans,* were often accused of provoking indigestion and camp diarrhœa during the civil war. The hard bread appears to have acquired its bad reputation chiefly from the fact that fragments of it were frequently recognized in the stools of those suffering with chronic fluxes; and perhaps in such cases it may actually have acted as an irritant, especially when bolted without sufficient mastication. But the experience of sailors, and of the army in time of peace, seems to show conclusively that hard bread is of itself a wholesome article of diet, and that it may be used without injury when combined with other food in sufficient quantity and variety. Nor is there good reason for believing that beans deserved the blame which was thrown upon them. From the earliest times they have had the reputation of producing flatulency, but have been charged rather with constipating than relaxing the bowels.† Galen relates that a sort of bean soup was in his time used by the gladiators, and in our own army, in times of peace, bean soup has always been popular.

Modern chemistry fully confirms the opinion, long entertained, as to the high nutritive value of beans by discovering in them nearly twice the percentage of nitrogenous matter found in ordinary wheat flour.‡ The microscope shows that the starch-containing cells which make up the substance of the grains have much thicker cellulose walls than the cells of wheat. These walls are slowly soluble in the digestive juices, and hence, if beans are eaten in large quantities, a portion of their substance is apt to escape undigested with the fæces, where the undissolved cells can be recognized with the microscope, and the starch grains give the characteristic iodine reaction.§ But the same thing occurs also, though to a less degree, with other starch-containing grains, including wheat flour;‖ and in the case of beans the undigested portions do not appear to give rise to any intestinal irritation, provided the beans are thoroughly boiled and the skins strained out. This latter precaution is certainly important, especially in cooking for troops in time of war; if it be neglected, the greater part of the skins pass through the alimentary canal unaltered, and

* In illustration of the opinion that hard bread was a cause of camp diarrhœa, see, in Section II, the remarks of VOLLUM, p. 71; TIBBALS, p. 74; MOTTRAM, p. 97, and TOWNSHEND, p. 98; see also J. R. BLACK—*Camp diarrhœa*, The Cincinnati Lancet and Observer, Vol. VII, 1861, p. 275. For a sweeping condemnation of hard bread, in which it is accused of producing not only diarrhœa, but "paralytic tendencies, a disposition to fibrous depositions in the heart and lungs, pains in the extremities and back, and derangements of the ear and eye," with a suggestion that "erysipelas and hospital gangrene" may have a similar origin, see p. 28 of the essay of SALISBURY, cited p. 373, *supra*. This writer errs, in part because he attributes the symptoms of scurvy to the use of hard bread, instead of blaming the absence of other articles of food; in part his statements are purely imaginative. With regard to beans, see, in Section II, the remarks of MARTIN, p. 73; WOOD, p. 74, and BRADT, p. 100; see also J. T. CALHOUN—*loc. cit.*, p. 626, *supra;* also C. F. W. HAASE, Surgeon 5th N. Y. S. M.—*Camp life*, Amer. Med. Times, Vol. III, 1861, p. 181—who attributes much of the diarrhœa at that early period of the war to the use of beans, asserting that whenever desiccated vegetables were substituted the number of cases greatly diminished.

† Thus, in the Hippocratic treatise, *De Victus Ratione*, Lib. II, § 45, [Ed. Littré, VI, 513,] we are told that beans are nourishing, binding and flatulent, and it is explained that they are flatulent because the pores are not able to take up all the abundant nourishment they furnish. GALEN—*De Alimentorum Facultatibus*, Lib. I, Cap. 19, [Ed. Kühn, VI, 523,]—mentions that in his day beans were used in manifold ways, liquid soups and thick pastes being made from them, and they were also prepared with barley broth; this latter form of soup he says was used by the gladiators. He adds that however cooked, beans are flatulent, even if boiled for a long time. See also the commentary of Dr. ADAMS on PAULUS ÆGINETA, Lib. I, Cap. 79, Vol. I, p. 125, Ed. cited *supra*, p. 624.

‡ A. PAYEN—*Précis Théorique et Pratique des Substances Alimentaires*, 4me Éd., Paris, 1865, p. 331—assigns from 24 to 30 per cent. of nitrogenous matter to different kinds of beans. The analyses cited by PARKES—p. 235, *op. cit.*, p. 599, *supra*—give from 22 to nearly 30 per cent., while according to the same writer—p. 206, note *—wheat flour contains on an average about 14 per cent. of nitrogenous matter.

§ PARKES—*loc. cit.*—makes a similar statement with regard to peas; "About 6.5 per cent. of the ingested pea passes out unchanged, and starch-cells, giving a blue reaction with iodine, are found in the fæces." But his further statement that "much flatus is also produced by the sulphuretted hydrogen formed from the legumin," is, I suppose, rather an inference than a matter of observation. An exceedingly small quantity of sulphuretted hydrogen will give its odor to a large quantity of other gases; see the analyses of flatus by RUGE.—note * to p. 189, *supra*.

‖ The bran of wheat is certainly more irritating than even the skins of beans; neither should be given as food to persons suffering under alvine fluxes.

undoubtedly, in the case of those whose digestive organs are at all sensitive, produce more or less irritation. It was probably the common observation of this circumstance, in patients suffering under camp diarrhœa, that led to the unfavorable opinions so many medical officers formed with regard to the use of beans as food during the civil war, and it is very likely that in those whose bowels were already deranged the undigested skins aggravated the disorder. But it must not be forgotten that the skins pass unaltered through the alimentary canal in healthy individuals also, and usually with impunity, as any one can satisfy himself by observation, although they are in this case concealed in the fæcal mass and not noticed unless specially searched for.

Even if the food was unobjectionable, *bad cooking* was looked upon as a cause of diarrhœa by many surgeons, and the common practice of making fried messes with mixtures of meat and hard bread,* etc., was very generally condemned. Errors of this kind undoubtedly favor the development of dyspepsia, and thus render the subject more susceptible to the inroads of diarrhœa and dysentery, but there is no evidence to show that they can of themselves give rise to alvine fluxes. The sutler's pies and cakes came in, too, for their share of blame,† though it is probable enough that by introducing some variety into the monotony of the ration they did on the whole more good than harm. Sudden changes in diet were also sometimes charged with producing diarrhœa, particularly the mild epidemics already spoken of as occurring in the case of recruits and regiments newly mustered into service.‡ It is not unlikely that alimentary conditions had something to do with the production of these outbreaks, but the complete change of the mode of life in other respects could not have been without its influence.

In all cases the ingestion of indigestible food acts at first merely by producing an irritation of the mucous membrane, which, if severe enough, brings on vomiting, purging, or both, and so gets rid of the obnoxious substance. The relief thus afforded is very generally complete, and at the same time the experience serves as a warning against a repetition of the offense. Occasionally the first irritation is so severe as to initiate an intestinal catarrh that may persist with variable issue; most frequently the catarrh resulting from this cause is of a transitory character; in either event the resulting flux usually manifests itself in the form of cholera morbus or diarrhœa, and seldom or never assumes that of dysentery unless other causes coexist. If the ingestion of unsuitable food be persisted in, its action may in some cases keep up and intensify the inflammatory process until grave diarrhœa or even catarrhal dysentery results. But the usual mode in which intestinal diseases are produced by this cause is by no means so simple: it is, namely, through the production of dyspeptic and scorbutic conditions, local debility or other disorders of the digestive functions on the one hand, and slowly produced modifications of the general nutrition on the other, that the flux is ultimately brought on, or the system rendered susceptible to the action of other causes which are yet to be considered.

Dyspeptic conditions and constipation.—In certain debilitated conditions of the digestive functions the alimentary mass, or some part of it, undergoes various fermentative changes which even may, in extreme cases, assume a more or less putrefactive character.

* As to this practice, see the remarks in Section II of Schell, p. 70; Vollum, p. 71; and Martin, p. 73; see also J. R. Black, *loc. cit.*, p. 629, *supra*.

† See, in Section II, the remarks of Brown, p. 77; Sanborn, p. 94; Bidwell, p. 96; and Bache, p. 99; with which compare the remarks of Virchow, cited p. 620, *supra*.

‡ See the remarks on these initial outbreaks, pp. 285–6, *supra*. The opinion that change of diet was a cause is expressed in several of the reports in Section II, *e. g.*, by Chamberlain, p. 67; Barker, p. 68; Day, p. 69; and Leonard, p. 70.

In proportion as the restraining antiseptic influence of the normal secretions is diminished these fermentative and putrefactive changes more and more approximate those which would occur in the same substances kept at the same temperature out of the body. Much remains to be learned with regard to the minor degrees of these processes, but it is pretty generally recognized that in extreme cases the starchy and saccharine ingredients of the food may pass into lactic- or acetic-acid fermentation, that the fat-acids may be set free from the fatty ingredients of the food and ammoniacal compounds liberated from its nitrogenous elements. That some of the products of these abnormal processes, even when the food itself is wholesome, may act as irritants to the intestinal mucous membrane and give rise to vomiting, diarrhœa, or both, was already confidently believed by the Greek physicians.* Since their time the matter has been made the subject of many studies, yet our own knowledge with regard to it is still very unsatisfactory.

Virchow has suggested† that the ammoniacal compounds set free by putrefactive changes in the nitrogenous matters of the food are especially liable to give rise to dysentery. Not merely is the temperature of the body favorable to the occurrence of these changes, when they are not restrained by the normal antiseptic secretions, but the mucus of the intestines and the detached epithelial cells it often contains may, in his opinion, act as ferments, as the mucus and epithelium of the urinary bladder do in the case of retained urine. The modified secretion of the inflamed mucous membrane, when intestinal catarrh already from any cause exists, is a still more active ferment; and in either case the intensity of the result is favored by whatever produces retention of the intestinal contents and thus affords time for the completion of the putrefactive process. In this manner he explains the influence of previous constipation in the production of dysentery, which had been insisted upon by Cleghorn, Chalmers, Cullen and Annesley;‡ the retained fæces enter into a putrid decomposition, and the ammoniacal compounds set free act as powerful local irritants, capable of setting up a brisk inflammation of the mucous membrane, or, when this already exists, of intensifying it until it assumes the diphtheritic character. Several circumstances show that this view is true for a certain class of cases: The catarrhal and diphtheritic inflammation, the ulceration, sloughing and perforation of the mucous membrane in contact with the fæcal mass that accumulates above the point of obstruction in cases of stricture, peritoneal bands, volvulus, etc.; the experimental production of dysentery by injections of ammonia;§ and the fact that constipation often immediately precedes the occurrence of dysentery, are especially significant in this connection. But it would be exceedingly unsafe to assume that considerations of this kind represent the whole etiology of dysentery. While it is true that constipation often precedes dysentery, this is by no means universally the case, nor is it true even in the majority of instances. A preceding diarrhœa of several weeks' duration, by which the intestinal canal is thoroughly emptied out, is even more common, and the scybala, of which so much has been said, are by no means of such frequent occurrence as has sometimes been assumed.‖

If constipation stood in any direct causal relation to dysentery it might be expected that it would occur most frequently in those districts in which dysentery prevails, and at about the same season as dysentery or a little earlier. Now the systems of reports pursued in the United States Army require every soldier excused from duty even for a day to be

* See, especially, GALEN—*loc. cit.*, note ‖, p. 623, *supra*.

† VIRCHOW—*Hist. etc. der Unterleibsaffektionen*, Archiv, Bd. V, S. 325-333 u. 352 *et seq.*

‡ See note ‡, p. 353, *supra*. § See p. 480, *supra*. ‖ See p. 353, *supra*.

placed on sick report. A soldier suffering merely from constipation, who receives a purgative from the regimental surgeon, is reported as a case of constipation if excused from duty. The number of such cases reported among the white troops during the five years ending June 30, 1866, was 145,960.* These figures do not include any of those occurring in the hospital population, and of course represent only the more serious cases of constipation; yet the number is so large that their distribution by season and region must give a very just idea of the actual distribution of constipation among our troops. Now it is worthy of note that the ratios deduced from these figures do not show any agreement in the regional distribution of constipation with that of dysentery during the war. So far from this being the case, it was precisely where diarrhœa and dysentery were most frequent that constipation was least so; its average annual ratio per 1,000 of strength during the time specified being 132 for the Pacific, 70 for the Atlantic and 60 for the Central Region; whereas the fluxes were least frequent in the Pacific and most common in the Central Region. Nor did the fluctuations of the ratios from year to year in either region agree at all with those of diarrhœa and dysentery. It is true that the monthly fluctuations so far harmonize that the ratios of constipation for the summer months were somewhat larger than those for the winter months, but they by no means follow the peculiar curves of diarrhœa and dysentery in any region, and, moreover, as compared with these, the variations were very small.

These circumstances would seem to show that other more influential causes were at work in the production of the intestinal fluxes of the civil war. Moreover, while in certain cases the explanation of Virchow seems to offer the best interpretation of the observed facts, there are others which show that neither constipation nor fæcal retention is a necessary condition even for the putrid fermentation of the alimentary mass. Not only when no constipation exists, but during the actual progress of diarrhœa, divers fermentations may occur in the intestinal contents, and it is probable that various irritating substances may thus arise: as yet ammonia and its compounds are the best known of these, but it is by no means likely that they are the only ones.

Is it now probable that, besides the irritants of the intestinal mucous membrane which may be contained in the ingesta or produced from them by chemical changes in the alimentary canal, the body of the sick man may itself furnish diseased secretions capable of exercising an irritant action? The Greek physicians affirmed the truth of this view: They held that vicious humors arising in any part of the body might find their way to the alimentary canal, accumulate there and by their irritative action give rise to diarrhœa and dysentery. Either phlegm, yellow bile or black bile might act in this way.† Long after the ancient conception of yellow bile as one of the four humors had disappeared from

* The number reported among the colored troops was 17,204. The ratios deduced in this case agree no better with the ratios of diarrhœa and dysentery than those for the white troops. Thus, in the year ending June 30, 1864, the ratio per 1,000 of strength for constipation among the colored troops was 154 for the Atlantic and 102 for the Central Region, while the cases of diarrhœa and dysentery were more numerous in the Central Region. The following year the cases of diarrhœa and dysentery were more numerous in the Atlantic Region, but now the cases of constipation were more numerous in the Central, the ratios being 87 per 1,000 of strength for the former and 98 for the latter. Compare these ratios and those for constipation mentioned in the text with the ratios for diarrhœa and dysentery given in Section I of this Chapter. Further particulars and ratios with regard to constipation will be given in the Third Volume of the Medical History of the War.

† See, for example, the passages in GALEN, cited note ‡, p. 333, *supra;* also, on the Greek doctrine of the origin of diarrhœa and dysentery by a flux of humors, note *, p. 341, *supra;* with regard to dysentery from black bile, note †, p. 392, *supra.* The Arabians adopted the Greek opinion on this subject. AVICENNA—*Canon*, Lib. III, Fen 16, Tract. I, Cap. 2, Venitiis, apud Juntas, 1595, T. I, p. 810—went so far as to fix the time necessary for each of these humors to produce ulceration: yellow bile required 14 days, phlegm a month, black bile 40 days. In striking contrast to these old views may be cited the observations of UFFELMANN—S. 241, *op. cit.*, p. 388, *supra*—on a woman laboring under a biliary fistula, who suffered a smart attack of dysentery accompanied by fever. By the second day of the disease the fistula, which had been discharging bile freely, became perfectly dry, and so continued until the 9th day, when, the fever having subsided and the appetite begun to return, the first traces of restored biliary secretion were recognized at the orifice of the fistula. A similar suppression had previously occurred to the same patient during an attack of pneumonia, but in this instance the secretion when restored was of the normal brownish color, while after its suppression in dysentery it was at first decidedly greenish, and only regained its usual appearance after the lapse of several days.

medical literature and bile came to be regarded merely as a secretion of the liver, it was a common belief that the irritant action of a morbid bile poured out into the intestine was an important factor in the causation of dysentery. The prominence given to this view by Degner and the modifications it subsequently experienced have been sketched in a previous portion of this Section.* But in a large proportion of the cases of dysentery the secretion of bile is very greatly diminished or altogether suppressed. In the so-called bilious cases,† even where copious vomiting and purging of bilious matters occur in the early stages, there is no evidence that the bile itself acts as the irritant that initiates the disease;‡ much rather does it appear probable that the excessive secretion, when it really is excessive, results from an irritation affecting the liver simultaneously with the gastro-intestinal inflammation, or propagated to the liver through the biliary passages from the intestinal canal. This "bilious complication" is quite as common in connection with mild gastro-intestinal catarrhs as with dysentery; the ordinary cholera morbus of the summer months furnishes a familiar example. It is probable that in many of these cases there is no actual increase of the hepatic secretion, but the digestive process being interfered with, and the passage of substances through the alimentary canal hastened, the bile secreted is voided before it has time to undergo the metamorphoses that occur in the normal condition, and hence appears to be more abundant than it really is: We possess no exact information as to this point, and further investigations, guided by modern knowledge of the physiology of the hepatic secretion, are greatly to be desired.

The excessive secretion or abnormal character of the bile is then to be regarded merely as a complication of diarrhœa or dysentery; we have no satisfactory evidence that it ever acts as its cause; nor have we any evidence that this role is played by any other normal or abnormal secretion that finds its way into the alimentary canal, with the single exception of urea, which is sometimes vicariously excreted by the intestine. Whenever the kidneys fail to separate the urea accumulating in the blood, it is thrown off by other organs, especially by the skin and the intestinal mucous membrane. Amidst the fermentations going on in the alimentary canal urea speedily breaks up into carbonate of ammonia, which acts as a local irritant, just as ammoniacal compounds set free by the putrefaction of nitrogenous matters in the alimentary canal may do. That this condition actually occurs in certain cases of Bright's disease of the kidneys, and that diarrhœa, catarrhal dysentery, or even the severest forms of diphtheritic dysentery may be caused by the irritant action of the carbonate of ammonia thus set free, appears to be established beyond question. But Treitz§ has altogether exaggerated the frequency with which dysentery is produced in this way, and his speculation that exposure to cold produces dysentery by checking the kidney secretion and causing urea to be separated by the intestinal mucous membrane is unsupported by actual observation.

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* See p. 394, *supra*. † See p. 395, *supra*.

‡ BAERALLIER—p. 724, *op. cit.*, p. 603, *supra*—speaks, perhaps inadvertently, as if the contrary had been proven: "Les travaux de Bouisson (de Montpellier) ont démontré l'action réelle de la bile sur les actes morbides qui se passent dans le tube digestif; il résulte de ses expériences que lorsqu'une grande quantité de ce liquide arrive dans les intestins, les digestions sont troublées, et que les malades sont pris de coliques et de diarrhée," &c. Now certainly F. BOUISSON—*De la Bile*, &c., Montpellier, 1843, p. 123—does make the statement that these are the effects of an increased quantity of bile (polycholie:) but he no more attempts to prove by experiment this old belief than to prove the actual existence of polycholie by observation.

§ See p. 386, *supra*. This view appears to be an amplification of a suggestion previously made by VIRCHOW, p. 355, *op. cit.*, p. 631, *supra*. Speaking of the decompositions of the contents of the alimentary canal in dysentery, he says: "Without the presence of the fecal masses, a part of the material for the decomposition would be wanting; the processes of decomposition would not attain the intensity, (Höhe;) their products the acrimony, (Schärfe;) nor the irritation the local duration and mechanical increment (Steigerung) necessary to generate a genuine fully-developed dysentery. But the decomposing substances are of a more or less alkaline nature, and if it should be generally established, as C. Schmidt (Charakteristik der epidem. Cholera, 1850, S. 96, folg.) incidentally mentions, that urea is mingled with the intestinal secretions in dysentery, it would be very simple to explain the preponderating occurrence of ammonia among the products of decomposition."

PORTAL CONGESTION.—In this connection a few words may be said with regard to a condition which has been thought to play a considerable part in the production of the intestinal fluxes in consequence of its direct influence upon the circulation of the blood in the intestinal mucous membrane: I refer to congestion of the portal system of bloodvessels. Attention was first directed to the real and supposed morbid influences of anomalies in the portal circulation by George Ernest Stahl,* (1698,) since whose time various speculations, which need not here be discussed, have been advanced with regard to the consequences of these anomalies.† The present state of our knowledge of this subject is briefly as follows: The portal circulation, while it shares the physiological characters of the general circulation, undoubtedly offers certain peculiarities which favor the development of local congestions. The absence of valves in the veins that unite to form the portal trunk and in the branches of the latter, as well as the fact that these branches ramify through a second system of capillaries in the substance of the liver, introduces a special series of mechanical conditions which must be considered in studying the disturbances of this portion of the circulation. Moreover, as the movement of the blood through these vessels is normally assisted by the intermittent pressure of the respiratory movements, of the intestinal contents, and of the contraction of the abdominal muscles, it may be impeded by various thoracic disorders as well as by disorders of the abdominal viscera.

Abdominal congestion may result on the one hand from a dilatation of the cœliac axis, the mesenteric arteries or any of their branches, in consequence of which a greater supply of blood is received by the abdominal viscera or some portion of them; on the other hand it may be the consequence of some mechanical retardation of the venous current. The so-called active congestion, resulting from arterial dilatation, takes place under the influence of the vascular nerves, as a reflex action set on foot either by some distant irritation or by nutritive disturbances in some portion of the abdominal organs themselves. The mechanism by which it is effected seems to be simply a relaxation of the circular muscular fibres of the arteries involved. A general abdominal plethora produced in this

* The essay of J. P. GAETKE, sub presidio G. E. STAHL—*Diss. med. inaug. de vena portæ porta malorum hypochondriaco-splenctico-suffocativo-hysterico-colico-hæmorrhoidariorum*, Halle, 1698; I cite a reprint, Halle, 1726—contains his doctrine on the subject. It treats in Sect. I of the anatomical relations of the portal circulation, insisting particularly on the absence of valves and the distribution of the branches of the portal vein in the substance of the liver. In Sect. II the physiology of the portal circulation is discussed; the motion of the blood in these vessels is not caused by the impetus of the heart, but partly by the mechanical impulse of the respiratory movements, partly by a special tonic motion, resembling the peristaltic motion of the intestine, which has its seat in the mesentery, and by which the blood is constantly propelled forward. Sect. III treats of the diseases of the portal circle: "De passionibus, venæ portæ familiaribus." Here he included not only lesions of the vessel and its branches or vitiation of the contained blood, but all the affections of the annexed viscera which he believed to result therefrom. These he treats under four heads: 1, Lesions of the capacity of these vessels; 2, of the consistency of the contained blood; 3, of the motions of the blood, especially those of a passive character; and 4, lesions and alterations of a more active character in the motion of the annexed parts, especially of the intestines, the mesentery and the spleen. Sect. IV deals with the therapeutic measures adapted to the foregoing lesions. An interesting account of these views of STAHL will be found in the essay of VIRCHOW, cited p. 631, *supra*. According to him they are also fully elaborated in the essay of ALBERTI—*Tract. de hæmorrhoidibus*, Halle, 1722—a copy of which I have not been able to see.

† I may merely refer in this connection to the doctrine of obstruction of the abdominal viscera or infarctus propounded by J. KÄMPF—*Für Aerzte und Kranken bestimmte Abhandlung von einer neuen Methode, die hartnäckigsten Krankheiten, die ihren Sitz im Unterleibe haben, besonders die Hypochondrie, sicher und gründlich zu heilen*, Dessau und Leipzig, 1784—in an essay remarkable alike for the extraordinary language often used and the confusion of ideas which frequently characterizes the speculations of its author. According to his formal definition of the term infarction—Cap. I, S. 22—he meant it to embrace preternatural obstructions of the portal vein and its branches, and anomalies in the contents of these vessels, and hence of course the consequences of these conditions in the spleen, alimentary canal and mesentery as well as in the liver. He subdivided infarctus into two kinds: In the first the obstructing material was diseased blood; in the second diseased serum mingled with lymph, or, as he called it, *pituita*. Of each of these he made five genera; and as his conception of infarctus embraced also abnormal accumulations in the hollow cavities of the affected organs, and especially of the intestines, descriptions of the most diverse intestinal contents, including undigested food of the most various kinds, are mingled with his fanciful accounts of pituita and black bile. Some of the cases reported in this work have already been referred to (note ‡, p. 365, *supra*) as examples of tubular diarrhœa; perhaps others were of the same nature, but it is not always possible to identify the conditions described. As the universal remedy for infarctus and its accompanying evils, KÄMPF lauded the use of what he called visceral clysters, (die Viszeralklistire,) brewed from a mixture of herbs, among which I note taraxacum, valerian, myrrh, arnica, verbascum, millefolium, dulcamara, conium maculatum, &c., on the selection of which for particular cases and the detailed mode of preparation he laid superstitious stress. This singular book appears to have been intended more for popular than for professional use, but it long found a certain number of followers in the profession as well as out. As late as 1853 O. KOHLRAUSCH—*Ueber sogenannte Infarkten*, Müller's Archiv für Anat. Phys., &c., Jahrg., 1853, S. 151—thought it worth while to publish an essay, illustrated by several figures, to show that the masses in the stools, still known as Infarkten, were composed chiefly of undigested vegetable cells and other debris from the food, along with fungi (Schimmelfäsern.) &c. VIRCHOW—S. 299, *op. cit.*, last note—gives a graphic account of the doctrine of KÄMPF, to which the reader is referred.

way would only be an exaggeration of the physiological conditions that occur during the time of digestion. Virchow* has suggested that extreme dilatation of this sort affecting the cœliac axis may explain some of the cases of transitory pulsation in the epigastric region, which can occasionally be felt by the physician as well as by the patient. But a recognizable plethora of this kind is far less frequent than an arterial hyperæmia of individual parts, *e. g.*, of the gastro-intestinal mucous membrane or some portions of it produced in the same way; this may occur without inflammation, but very generally accompanies some degree of the inflammatory process, and is to be looked upon rather as one of the phenomena of inflammation than as its cause.

Passive congestion or venous hyperæmia of the abdominal organs, which is the condition generally understood when portal congestion is spoken of, may result in some cases from preternatural dilatation of the portal vein itself, or more frequently of the veins which unite to form it, in consequence of relaxation of their circular muscular fibres,† or of anomalies in the nutrition of their walls similar to those which occur in varicose veins;‡ but local disturbances, as for example hæmorrhoids, much more frequently arise in this way than general abdominal congestion. Portal congestion may also be produced by whatever interferes with the propulsive powers that carry on the portal circulation. Here, in addition to the resistances which the venous circulation elsewhere encounters, special resistances are introduced by the passage of the blood through a second set of capillaries in the liver. Diminished energy of the cardiac contractions, by which the chief motive force of the circulation is furnished here as elsewhere, or of the respiratory movements and other muscular actions that normally assist the portal circulation, may be followed by passive congestions in the abdominal viscera, although the normal resistance remains unchanged; such congestions occur chiefly in individuals who have from any cause fallen into an extreme condition of marasmus.§ Moreover, while the propulsive powers remain normal or nearly so, portal congestion may be produced by mechanical obstructions, such as result from valvular disease of the heart, aneurism of the aorta, tubercles of the lungs or other diseases of the thoracic viscera that offer mechanical obstacles to the general circulation; or from diseases of the liver itself, as cancer, cirrhosis, amyloid and fatty degeneration, parenchymatous inflammation, etc., by which the motion of the blood through the organ is impeded.‖ That mere functional disturbance of the liver, giving rise to congestion of that organ, may in like manner interfere with the portal circulation and so determine abdominal congestion is probable enough; but the popular opinion which regards these congested conditions as a direct cause of diarrhœa and dysentery is not supported by evidence.

Experiments on animals, such as those of Cohnheim,¶ show that passive hyperæmia produced by the mechanical obstruction of venous trunks gives rise to œdematous infiltration of the congested tissues, and that it may cause hæmorrhage into the tissues, but not

* S. 288, *op. cit.*, p. 631, *supra*.

† KÖLLIKER und VIRCHOW—*Ueber einige an der Leiche eines Hingerichteten angestellte Versuche und Beobachtungen*, Würzburg Verhandlungen, Bd. I, 1850, S. 319—in the body of a decapitated criminal, examined 35 minutes after death, obtained by the use of galvanism no contraction of the portal vein, and only a little in a branch of the superior mesenteric vein, although the great saphena vein and its branches and the lymphatic vessels of diverse regions were still very contractile; whence VIRCHOW concludes—S. 295, *op. cit.*, p. 631, *supra*—that it is doubtful whether the muscular coat of the portal vein exercises any considerable influence on its calibre. According to the same author—S. 297, *op. cit.*—the varicose dilatations, referred to in the text, occur chiefly in the veins of the stomach, spleen and rectum.

‡ See VIRCHOW—S. 297, *op. cit.* § See VIRCHOW—S. 289, *op. cit.*

‖ To these causes VIRCHOW—S. 293, *op. cit.*—adds external compression, such as is produced by tight corsets, &c.

¶ J. COHNHEIM—*Ueber venöse Stauung*, Virchow's Archiv, Bd. XLI, 1867, S. 221: "Es entwickelt sich Oedem oder Hydrops, aber keine Phlegmone." Compare the account of passive or mechanical hyperæmia given by E. WAGNER—*Manual of General Pathology*, Amer. Transl., New York, 1872, p. 183 *et seq.* According to the latter writer chronic catarrh is a consequence of the venous hyperæmia of the intestinal mucous membrane. VIRCHOW—S. 310, *op. cit.*—in making the same statement remarks, however, that it is not every catarrh of the intestine that produces diarrhœa.

inflammation. An examination of the symptoms of the unmistakable portal congestion that results from cirrhosis of the liver shows that neither diarrhœa nor dysentery is a necessary consequence of this condition. Ascites is a very frequent sequel, but inflammatory affections of the mucous membrane of the alimentary canal are by no means invariable concomitants. Indeed Frerichs has shown that in the bodies of those dead of cirrhosis it is much more common to find catarrhal tumefaction, erosion and ulceration of the mucous membrane of the stomach than similar lesions of the intestine. He tells us that the bowels are generally costive, particularly in the early stages; even in the later stages diarrhœa does not occur in the majority of cases. Still rarer in the experience of Frerichs was the occurrence of diarrhœa in cases of chronic hepatic hyperæmia and portal obstruction resulting from valvular disease of the heart and embarrassment of the pulmonary circulation.* In the face of such facts how unreasonable it would be to assume that transient congestions of the portal circulation can play any conspicuous part in the direct causation of the intestinal fluxes. And yet in the case of marked cirrhosis diarrhœa occurs so much more frequently than it would be likely to do in healthy persons, that we may well suppose with Murchison,† that the congested condition of the mucous membrane in this disease is favorable to the action of the causes of intestinal inflammation, and perhaps in this way the occurrence even of transient portal congestion may favor indirectly the development of diarrhœa or even of dysentery. Nor do I doubt that the pre-existence of chronic venous congestion is likely to determine an unfavorable progress in the inflammatory process when it has once been developed by other causes, and perhaps the more transient congestions may produce to a less degree a similar tendency.

Constitutional condition of those exposed.—The influences which do not appear to act directly upon the alimentary canal, but seem to cause the alvine fluxes or to favor their development by an action upon some other part of the body or upon the constitution generally, have next to be considered; and here first the constitutional condition of those exposed requires attention. Mere exhaustion, from fatigue, over exertion and loss of sleep, as during long marches, sieges and battles of several days' duration, produces a condition favorable to the inroads of several diseases, among which diarrhœa and dysentery are conspicuous. In like manner almost any constitutional disorder of a debilitating character, however produced, favors the development of these diseases among those exposed to their causes. The observations of Finger,‡ during the Prague epidemic, as to the frequency with which dysentery attacked patients already laboring under lung-phthisis, cancer, typhus, secondary syphilis and Bright's disease of the kidneys, and its great mortality in these complicated cases, were abundantly confirmed by our own experiences in the civil war, during which also the relation of pre-existing diseases to the development of diarrhœa was found to be of a very similar character. The frequency with which the different abnormal constitutional conditions were followed by fluxes varied considerably, some seeming to be

* F. T. Frerichs—*Clinical Treatise on Diseases of the Liver*, Transl. of New Syd. Soc., Vol. II, London, 1861, p. 45. Catarrhal conditions of the stomach were observed in 26 out of 36 subjects dead of cirrhosis. The mucous membrane of the large intestine is said to have been "softened and of a livid hue" in 13 cases; "in 5 cases, there were superficial catarrhal ulcerations. The small intestine was rarely implicated, and never more than very slightly." Persistent diarrhœa had occurred in but ten of these 36 cases; in two of these, however, tubercular ulceration of the intestines coexisted, p. 47. In Vol. I, London, 1860, of the same work, I read—p. 366—that in 20 cases of hepatic hyperæmia arising from obstruction to the circulation of the blood ("Stauungshyperæmie") "transient diarrhœa" was observed in 4 cases only. "The bowels, as a rule, are confined."

† Charles Murchison—*Clinical Lectures on Diseases of the Liver*, etc., Amer. Reprint, New York, 1868, Lecture 7, p. 248: "Gastritis and enteritis also frequently occur in the course of cirrhosis, the congested mucous membrane being excited to inflammation by causes which would otherwise be inert."

‡ S. 134, *op. cit.*, p. 552, *supra*.

much more favorable to their occurrence than others. Among those which appeared to exercise the most considerable influence in this direction during the civil war, tuberculosis, typhoid and typho-malarial fevers, the malarial fevers and chronic malarial poisoning, and the scorbutic taint, may be particularly mentioned.

The victims of tuberculosis were liable not merely to the form of diarrhœa that results from tubercular disease of the intestines,* but to simple catarrhal inflammations of the intestinal mucous membrane and diphtheritic dysentery. The frequency with which this class of cases proved fatal is well illustrated by the autopsies recorded in this chapter. In typhoid and typho-malarial fevers the peculiar enteric lesion characteristic of the disease was not merely associated in numerous instances with a catarrhal inflammation of the large intestine, but the flux set on foot was prone to persist after the fever had run its course, and a chronic dysentery based on follicular ulceration of the colon occurred in some cases, while in others acute diphtheritic dysentery supervened.† These complications will be discussed more fully in the chapter on camp fevers.

Still greater appeared to be the influence of the constitutional condition induced by the action of malaria, whether manifested by actual malarial fever or as a chronic malarial poisoning. Evidence has been presented in a former portion of this chapter which renders it highly probable that malaria *per se* cannot be regarded as an exciting cause of either diarrhœa or dysentery,‡ yet seems to show that when the causes of the alvine fluxes operate on a great scale, as in the case of armies, they are peculiarly prone to smite those who are debilitated by the malarial influence; hence we have seen that, while in the territory of the United States the distribution of the mortality of these diseases among the civil population has been on the whole greater in the non-malarial than in the malarial districts, the reverse was the case in our armies during the civil war. Nothing need be added here to what has already been said with regard to the relations existing between malaria and the fluxes.

But unquestionably of still greater moment, in connection with the etiology of the fluxes, were the various constitutional conditions resulting from insufficient or improperly selected alimentation, and which, on account of their general character, may be conveniently embraced under the head of *the scorbutic taint*. The subject of the relation of this taint to the alvine fluxes is so intimately allied to the general subject of scurvy that a detailed discussion must be postponed to the chapter on scurvy in the next volume. I shall here merely append in a foot note§ references to some of the medical officers who have testified

* See p. 578, *supra*. † See p. 587, p. 403 *et seq.*, and p. 496, *supra*.

‡ See p. 398 *et seq.* and p. 414 *et seq.*; compare also the remarks on pp. 487 and 496. Of the frequent association of the prevalent fevers of malarial districts with diarrhœa and dysentery, when the causes of these diseases also prevail, I of course entertain no doubts. To the testimony already brought forward to this effect (p. 398 *et seq.*) I may add that of CLEGHORN—*Obs. on the Epidemical Diseases in Minorca*, 4th Ed., London, 1779, p. 134; J. HUNTER—*Obs. on the Diseases of the Army in Jamaica*, London, 1788, p. 218; JAMES LIND—*Essay on Diseases incidental to Europeans in Hot Climates*, 5th Ed., London, 1792, p. 64 *et seq.*; and GILBERT BLANE—*Obs. on the Diseases of Seamen*, 3d Ed., London, 1799, p. 447. To the list of those who have held that the malarial fevers and dysentery have a common cause I may add the names of ROBERT JACKSON—*Outline of the History and Cure of Fever*, Edinburgh, 1798, p. 323—who "was convinced of the truth of it, from his own observation, in the late American war;" JAMES BANKIER—*Essays on the Origin, etc., of Dysentery*, Madras, 1835, p. 28; J. A. LIDELL—*Diseases of the Isthmus of Panama*, N. Y. Jour. of Med., Vol. IX, 1852, p. 78—who regarded malaria as the predisposing cause of the disease as seen among the laborers constructing the Panama railroad; and C. D. GRISWOLD—*Camp dysentery*, Boston Med. and Surg. Jour., Vol. LXV, 1861-2, p. 69—who was led, by his experience as surgeon of the Panama Railroad Co., to regard dysentery as an essentially malarious disease that could be cut short by quinine; an experience which was confirmed during his subsequent residence at Fort Hamilton, N. Y. Harbor, and during the epidemic of 1859 in Genesee Co., New York, in the latter instance the disease was associated "with a severe form of remittent usually called typhoid fever, and which without the administration of quinine in many cases proved fatal."

§ Consult, for example, in Section II, the reports of WOODWARD, p. 51; WRIGHT, p. 62; TIBBALS, and WOOD, p. 74; MORRISON, p. 77; MULFORD, p. 80; FORBES, p. 82; STRONG, and VEETER, p. 84; SCOTT, p. 85; BACHE, p. 88; BURDETT, p. 90; WALTON, p. 93; FARQUHARSON, p. 95; FRENCH, and MOTTRAM, p. 97; BERRY, p. 98; BROWNE, p. 99; BRADY, LEIGHTON, and STIPP, p. 100; see also the testimony with regard to the prevalence of scurvy or a scorbutic taint in the Army of the Potomac at Harrison's Landing in July, 1862, in the report of Medical Director LETTERMAN—Appendix to Part I, p. 93; with regard to the same army in June and July, 1864, the report of Medical Director MCPARLIN—*op. cit.*, pp. 101 and 104; with regard to the Army of the Ohio during the same summer, the report of Medical Director HEWIT—*op. cit.* p. 313; and with regard to the 2d division of the 2d corps during the same summer, the report of Surgeon FINK—*op. cit.*, p. 318. See also O. C. GIBBS, late surgeon 21st New York volunteers—*Army correspondence*, The Med. and Surg. Reporter, Vol. IX, 1862-3, p. 82—who writes from near Sharpsburg, Md., of the condition of his regiment at the time

to the existence of a scorbutic taint, or of actual scurvy among our troops during the civil war, especially those who have expressed the belief that this condition was directly or indirectly an important cause of the alvine fluxes that prevailed: further evidence of the same character will be produced hereafter.

For myself, I cannot regard the scorbutic condition as a direct cause of the alvine fluxes, for it may undoubtedly exist to a marked degree without any looseness of the bowels; but there is probably no cachetic state that is more favorable to the action of the other causes of these disorders, or confers upon them a graver character when they are once established. Alimentary irritants of every kind, whether contained in the food itself or begotten by its fermentation in impaired digestive conditions, including the putrid products of the decomposition of the fæcal mass in cases of constipation, act with especial energy in scorbutic subjects. These local irritants acting upon subjects whose health is impaired by this constitutional condition are, I believe, to be ranked among the chief causes of the prevalence of fluxes in armies in time of war, and I fear often also in time of peace. I cannot fully assent to the view which has recently been ingeniously advocated by Brunner,* that

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of the battle of Antietam: "Scurvy was breaking out, and in cases where this disease was not so manifest, prostration, or great fatigue on slight exertion, which symptoms were but the incipient stages of a scorbutic condition, was well marked. Diarrhœa was the prevailing disease." See also by the same—*Persulphate of iron in camp diarrhœa*, The Cincinnati Lancet and Observer, Vol. VI, 1863, p. 462: "I soon became convinced the disease had its origin in a lack of a suitable amount of vegetable food." He declares that "potatoes, onions, cabbages, &c., &c., were articles unknown in the army, for months in succession." H. H. GARDNER—*Chronic diarrhœa in the Army of the Cumberland*, American Med. Times, Vol. VIII, 1864, p. 102—declares that it owes its origin to two causes: "scurvy and miasmatic influences." I. A. COONS—*The cause of camp diarrhœa*, The Cincinnati Lancet and Observer, Vol. VII, 1864, p. 327: "The cause of camp diarrhœa seems to me to be the sameness of food, together with its deficiency in quality and quantity." And further on: "Camp diarrhœa is rather a symptom of scurvy than a disease of itself," p. 328. GEORGE D. WINCH—*Chronic diarrhœa*, Chicago Med. Jour., Vol. XXII, 1865, p. 346: "A want of vegetable diet is a common cause." Here, too, I may refer to the striking testimony of Brigade Surgeon C. H. RAWSON—*Health and hospitals in Mississippi*, The American Med. Times, Vol. V, 1862, p. 42—with regard to the prevalence of scurvy connected with diarrhœa in the army around Corinth in June, 1862. Surgeon RAWSON had been chief medical officer of the left wing of General POPE'S Army, and afterward Acting Medical Inspector. He testifies that the chief diseases among the troops at the time he wrote were "diarrhœa, remittion fever assuming a typhoid character, perhaps some typhoid fever, typhoid pneumonia, rheumatism, and scurvy." Of the latter, he says that it is "a species of land scurvy that is very insidious in its effects, and I think many men are suffering from it, who are being treated for many other diseases, * * *; the men complain they are daily becoming weaker, great muscular weakness, sometimes soreness with red spots, ecchymotic and swollen feet and legs, rheumatic pains, affecting bones, muscles, or any and every portion of the body. Some have pale, waxy, puffy, and anæmic swelling about the face; a few show ulcerated gums and mucous membrane, but they are comparatively few, appetite capricious and bowels irregular, but generally have diarrhœa." He emphasizes the occurrence of sudden death among this class of cases: "The man complains of lassitude and debility, is walking about, and finally dies very suddenly, or is found dead under a tree, where he has lain down to rest, or in using the chamber dies from the effort." In August, 1862, Surgeon RAWSON writes to the same Journal, same Vol., p. 125, from Corinth, Mississippi: "Diarrhœa, some dysentery, remittent and typhoid fevers, and scurvy, are the principal diseases at present. The latter prevails more extensively than it ought, but it is very difficult to get fresh vegetables in any quantity, nearly everything having to be brought from the north. The U. S. Sanitary Commission are furnishing some eggs, chickens, potatoes, etc., to general hospitals, but the supply is nothing to the demand and requirements." On noticing the first communication from Surgeon RAWSON, Dr. F. R. LYMAN, house-physician in Bellevue hospital, hastened to write to the same Journal—*Land scurvy*, same Vol., p. 125—that about 35 per cent. of all the patients received there from the Army of the Potomac from July 9th to August 20th, when he wrote, were affected with the same disease. Testimony as to the prevalence of the scorbutic taint or actual scurvy among the sick received in the general hospitals in Philadelphia from the Army of the Potomac, during 1862, has been given by STILLÉ—note §, p. 495, *supra*—and KEMPSTER, made similar observations elsewhere during the last two years of the war—same note. Here, too, I may refer to a paper by Assistant Surgeon W. E. WHITEHEAD, U. S. A.—*Camp diarrhœa*, Med. and Surg. Reporter, Vol. XV, 1866, p. 82—in which he advocates the view that the camp diarrhœa of soldiers is caused by a scorbutic condition of system, and this not merely from lack of antiscorbutics, but from improper cooking. His further suggestion, however, that the scorbutic condition of the blood may cause amyloid degeneration of the small arteries of the submucous coat of the intestine, and that this is the cause of the persistency of the disease, is a speculation unsupported by satisfactory evidence. D. A. MORSE, late Asst. Surgeon U. S. Vols.—*Camp diarrhœa*, same Vol., p. 296—has replied to the suggestions of WHITEHEAD: "I know of no reason why scurvy should be considered a cause of diarrhœa more than diarrhœa of scurvy." Yet if it were true generally, as he himself testifies of the prison at Camp Chase, that "nearly every one having scurvy had diarrhœa; but a large number having diarrhœa showed no signs of scurvy," it would be easy to see that the latter supposition is much more probable than the former. MORSE particularly emphasizes in this paper the fact that diarrhœa occurs in non-scorbutic subjects, which I suppose no one doubts.

* C. H. BRUNNER—*Zur Aetiologie der Ruhr*, Berliner Klin. Wochenschrift, Jahrg. XIV, 1877, p. 353. His reasoning is briefly as follows: There can be little doubt that dysentery is an infectious disease; *i. e.*, that it is not produced by any known atmospherical or telluric factors, but by some specific unknown cause acting upon the body from without. The infectious diseases generally are characterized by their dependence upon locality and human intercourse, ("Verkehr.") The relation of the individual infectious diseases to these two circumstances is very different. Thus, cholera, yellow fever, plague, the acute exanthemata and whooping cough, at least in the matter of their pandemic distribution, are chiefly dependent upon intercourse, while the other infectious diseases, including ileotyphus and dysentery, are chiefly dependent upon locality. Dysentery, it is true, occurs epidemically, but as stationary or localized, not as progressive epidemics. Patients who leave dysenteric districts for healthy localities may convey the disease to other individuals, but epidemics do not thence arise. Thus, in spite of the transfer of the dysenteric patients of the besieging army of Metz and the prisoners there taken, to all parts of Germany, no epidemic was set up throughout that country. And the same was true of intestinal typhus, but alas not of small-pox! What now are the local influences that determine the spread of dysentery? We may think of the latrines, of local atmospheric infection, of the drinking water, or of the food. The latrines appear excluded by the slight transmissibility of the disease from individual to individual, and especially by its epidemic frequency among the crews of ships in Asiatic waters, for ships have, properly speaking, no latrines. These latter instances likewise exclude emanations from the soil; and the frequent sporadic occurrence of the disease as well as the comparative immunity which officers often enjoy on shipboard, though exposed to the same atmosphere as the men, are also opposed to this view. Against the opinion that the drinking water is to blame speaks the spread of the disease over wide territories, as in the case of invading armies, in spite of the diversity of the water used, and its occurrence on

spoiled bread is the usual vehicle of the dysenteric infection, if not the essential cause of the disease; but I do not doubt that insufficient and improper food is directly or indirectly responsible for a great part of the disability and mortality produced in armies by the alvine fluxes and allied diseases, or that the question of the ration is one of the most important of those that are to be considered in connection with the prevention of diseases of this class. With this question, which deals with a cause of disease quite under administrative control, I propose to deal when the subject of scurvy is discussed.

METEOROLOGICAL CONDITIONS.—The influences of certain meteorological conditions on the development of diarrhœa and dysentery are manifested on the one hand by the varying frequency with which these diseases occur at different seasons of the year, and on the other by their geographical distribution. Experience shows that they are more prevalent and fatal in hot weather and in hot climates, and this would seem to suggest that high temperature, of itself, may play an important part in their etiology.* Yet it must not be overlooked that these diseases make their appearance also at all other seasons of the year, though less frequently than during the hot months. Moreover, while, as we have already seen, August is the month of their greatest mortality among the civil population of the United States,† neither in their prevalence nor their mortality did they follow this rule with any strictness during the civil war, but fluctuated considerably in different years and regions, as has been shown with sufficient detail in a previous part of this Section.‡

Nor does the geographical distribution of the fluxes correspond at all rigidly either with the mean temperature of the year or the summer heat of individual districts. Abundant testimony to this effect has been collected with regard to dysentery by Hirsch and Dutroulau.§ According to Lubrez,‖ dysentery is endemic in certain provinces of the north of Russia, and is exceedingly frequent in St. Petersburg, while it is much rarer in southern Russia, and especially in the Crimea. I have already shown that the mortality from diarrhœa and dysentery among the civil population of the United States¶ is on the whole greater in the northern than in the southern portion of our territory, and that local as well as general epidemics of dysentery seem particularly to smite the northern districts, while the reverse was the case during the civil war and in our military garrisons in time of peace.** A consideration of these and similar facts would seem to show that elevated temperature is to be regarded rather as a predisposing than an exciting cause of the alvine fluxes; of itself it does not give rise to them, but it seems to produce a condition of the system favorable to the influence of other causes whenever they are brought into action. The effect of elevated temperature on the production of the fluxes among soldiers is perhaps most strikingly shown when they are marched for some time in the hot sun: diarrhœa is of common occurrence under such circumstances; yet even here it is usually so small a portion of the troops

ships that use only distilled water. These different influences being excluded, there remains only the food to be considered. In favor of this view is the fact of the primarily local character of dysentery, (*i. e.*, it is limited to the intestinal canal,) its frequent complication with scurvy, the well known influence of heat and moisture which favor decomposition of food, and especially the fact that dysentery is the constant scourge of armies, (of which he quotes several examples.) For precisely in war, as in naval expeditions to the tropical regions, vegetables are hard to get, and both they and the breadstuffs are very apt to be damaged, as is very often the case on ships doing business in the tropics, and as was too often the case also during the Franco-German war. To such facts it may be added that epidemics on board ships cease forthwith when on their return to Europe they get fresh provisions, and that the epidemic at Metz was gradually extinguished when more regular supplies were afforded. Hence the suspicion arises that the spoiled bread (verdorbenes Brod) may be the vehicle of the specific cause of the disease, if not the specific cause itself. No tenable reason can be urged against this view, which also explains the occurrence of isolated epidemics in garrisons.

* See, on the subject of heat as a cause of dysentery, the paper of Surgeon J. F. HAMMOND, U. S. A.—*Brief account of dysentery as it occurred at Fort Jefferson, Tortugas, Florida*, The Amer. Jour. of the Med. Sci., Vol. XLIII, 1862, p. 66.

† See pp. 429 and 430, *supra*. ‡ See p. 18 *et seq.*, p. 290 *et seq.*, and p. 427 *et seq.*, *supra*.

§ A. HIRSCH—S. 225 *et seq.*, *op. cit.*, p. 551, *supra*. A. F. DUTROULAU—p. 556 *et seq.*, *op. cit.*, p. 618, *supra*.

‖ J. M. LUBREZ—p. 9, *op. cit.*, p. 618, *supra*. ¶ See p. 418 *et seq.*, *supra*. ** See p. 414 *et seq.*, *supra*.

exposed who suffer from disorder of the bowels, that the necessity of seeking for the coöperation of other causes is apparent.

With regard to the influence of variations in the hygrometric condition of the atmosphere upon the occurrence of the alvine fluxes, very little is known. Hirsch has pointed out the contradictory character of the testimony of observers as to this point in connection with tropical dysentery. Some of these have regarded a high degree of atmospheric moisture as favorable to the prevalence of the disease, while others with equal positiveness insist that it is most prevalent in extremely dry weather. Hirsch* examined the records of 119 epidemics of dysentery with reference to this point, and found that 62 began during or just after the occurrence of moist weather, while 57 arose and ran their course during persistent dry weather.† It seems probable, therefore, that variations in atmospheric moisture have little or no effect on the development of dysentery, or indeed of the alvine fluxes generally, though, probably, they exercise an occasional influence in connection with changes of temperature in producing the effect popularly described as taking cold.‡

Exposure to sudden changes of temperature is well known to act as the exciting cause of various internal inflammations, and these accidents appear more likely to occur when the atmosphere is damp, and especially during rainy weather. To these conditions troops in campaign, sleeping on the damp ground at night, their clothes wet through by the rain and no opportunity to change them afforded, are particularly exposed. Perfectly healthy and vigorous individuals often endure such exposures with impunity. Others are attacked, some with respiratory catarrhs, some with pleurisy or pneumonia, some with diarrhœa or dysentery.§ The diversity of effect is determined to a great extent by the individual peculiarities of those exposed; and of these peculiarities probably none are more influential than the previous existence of some actual morbid process. In popular language, it is the weak organ that suffers; that is, for the most part, the organ that is already more or less modified by disease.

The frequent occurrence under such circumstances of diarrhœa and dysentery among troops has long attracted the attention of military surgeons. Pringle‖ relates that the night following the battle of Dettingen the English troops lay on the field of battle without

* S. 235, *op. cit.*, last page.

† That heat and moisture favor the development of dysentery is an old belief. Thus HIPPOCRATES declared—*Aphoris. III*, 11, [Ed. Littré, IV, p. 491.]—that if the winter be dry and cold and the spring rainy and warm, acute fevers, ophthalmias and dysenteries will follow in the summer, especially among women, and men of moist constitution. On which GALEN comments—*Comm. in Aph. Hippoc., III*, 11, [Ed. Kühn, XVII, B, p. 578 *et seq.*]—that moisture and heat produce putrefaction of the humors: if the products remain in the body, fevers are generated, if expelled by the bowels, dysentery. "Manente igitur putridine in corpore fiunt febres; si vero ea per alvum vacuetur dysenteriæ"—p. 583.

‡ That alvine fluxes might originate in colds was known to GALEN, who declares—*Comm. III in Hippoc. de Humoribus Lib.*, § 11, [Ed. Kühn, XVI, p. 386.]—that from refrigeration or inequality and badness of the weather the stomach and intestines are vitiated, so that lientery, dysentery and diseases of the small intestine arise.

§ Surgeon C. A. HUNT, 126th Illinois volunteers—*Cold and wet a cause of camp disease, and its modus operandi*, Chicago Medical Examiner, Vol. IV, 1863, p. 226—has given an excellent illustration of this remark. Following a cold and protracted rain in the spring of 1863, twenty-five men of his regiment were taken sick in the camp near Jackson, Tennessee: "About ten had cold and cough, or catarrh; six took pneumonia biliosa; two pneumonia typhoides; two bronchitis with aphonia; one an intermittent, and about five with diarrhœa." One company of the regiment was stationed four miles south of Jackson: it had during the same time nine men taken sick: one with fever of a remittent type, and eight with "dysenteric flux."

‖ PRINGLE—*Obs. on the Diseases of the Army*, 7th Ed., London, 1774, p. 19. The battle of Dettingen was fought June 27, 1743. PRINGLE explains the circumstances mentioned in the text as follows: "For the summer had begun early, and the weather had been constantly warm; but the free and uninterrupted perspiration seemed to prevent any general sickness. Now, the pores were suddenly stopped, the body was chilled, and the humours tending to a resolution, from the preceding heats, were turned upon the bowels, and produced a dysentery, which continued a considerable part of the campaign." HEUBNER—S. 507, *op. cit., supra*, p. 529; also p. 525, Amer. Transl.—cites this incident as an example of the special influence of a particular camp site, and adds: "At a distance of half a mile from the rest of the army, though otherwise in like circumstances, (unter sonst ganz gleichen Verhältnissen,) a few companies had a camp close to the river, and remained perfectly well." This is a complete misrepresentation of PRINGLE'S narrative. These companies were not exposed to the rain, nor did they lie on the damp ground. PRINGLE says—*op. cit.*, p. 20: "Three companies of HOWARD'S which had not joined us, marched with the King's baggage from Ostend to Hanau, where arriving a night or two before the battle, and having orders to stop, they encamped for the first time about half a mile from the ground that was afterwards occupied by the army. These men had never been exposed to rain, nor had lain wet; by this separation from the line, they were also removed from the contagion of the privies; and having pitched close upon the river, they had the benefit of a constant stream of fresh air. By means of these favourable circumstances, it was remarkable, that while the main body thus suffered, this little camp almost entirely escaped."

tents, exposed to heavy rain. Next day they moved to Hanau and encamped on good ground in an open field, but it was wet, and for the first night or two the men wanted straw. During the eight days following the battle about five hundred men were seized with dysentery, and in a few weeks nearly half the army suffered from it. Not a few similar incidents occurred during our civil war. I have already referred to the siege of Fort Donelson* in February, 1862. The attack lasted three days, and about thirty thousand men were engaged. They were for the most part without tents or any other shelter, and could light no fires at night on account of the proximity of the enemy. The weather was at first excessively cold, then a light fall of snow, degenerating into sleet, occurred. I say nothing of the unavoidable suffering of the wounded; but Surgeon J. H. Brinton, U. S. V., the Medical Director of the Army of the Tennessee, to whom we owe this narrative, relates that "diarrhœa, dysentery, and pneumonia of a typhoid type became fearfully prevalent, and thousands of soldiers were broken down, and were then sent down the river to the general hospitals."

Similar was the experience of the troops belonging to the Army of the Potomac engaged in the operations against the Weldon railroad in December, 1864. Surgeon W. R. De Witt, Jr.,† U. S. V., Surgeon in Chief of the First Division, Fifth Corps, accompanied this expedition, and reports that the command to which he was attached moved on the 6th of December and returned on the 11th of the same month; "during this expedition there was considerable exposure, and, in consequence of the inclement weather, the men suffered greatly;" much sickness followed, chiefly "typhoid fever, chronic diarrhœa, typhoid pneumonia," etc. During the same month the Army of the Cumberland, under General Thomas, experienced similar misfortunes. Surgeon G. E. Cooper, U. S. A., Medical Director of that army, reports that during the pursuit of the retreating army of General Hood from Nashville to the Tennessee river the weather was of the most disagreeable character; rain fell for four successive days, and when this ceased it became severely cold. The results of this exposure were "severe affections of the pulmonary viscera, fevers, rheumatisms and diarrhœas, which served to fill the hospitals in this vicinity to their utmost capacity."‡

Incidents of this sort might readily be multiplied; but such extreme exposures as occurred in these instances are by no means necessary to produce similar results. Sleeping on the damp ground, or even standing on sentry duty during a summer night, will suffice, though to a less degree. Moreover, it appears to be rather the magnitude of the fluctuations than mere lowness of temperature that produces the morbific influence. The alternation of hot days with cool nights is therefore favorable to the development of colds. It is probable, indeed, that in a part of the cases in which direct exposure to heat, as on the march, appears to have given rise to alvine fluxes, subsequent chilling during the hours of rest or the succeeding night is really to blame. Such exposures were frequently accused in the reports of the medical officers of producing diarrhœa and dysentery during the civil war,§ and there can be no doubt that these accusations were often well founded.

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* See p. 288, *supra*; for the narrative of Surgeon J. H. BRINTON, U. S. V., see Appendix to Part I, p. 28.

† See Surgeon DE WITT'S report, Appendix to Part I, p. 213. ‡ See Surgeon COOPER'S report, Appendix to Part I p. 325.

§ See, for example, in Section II, the reports of HOLSTON, and VAN SLYCK, p. 66; BELLOWS, and CHAPEL, p. 70; MCKELWAY, p. 75; BRETZ, p. 80; FORBES, p. 82; VELTER, p. 84; SCOTT, p. 85; STEVENSON, and TAYLOR, p. 86; WALTON, p. 88; FINLEY, and MILLER, p. 89; TOMPKINS, p. 91; DEPEREY, and PHILLIPS, p. 92; FARQUHARSON, p. 95; ANGELL, p. 97; and BRADT, p. 100. See also, on the same subject, a letter from Surgeon J. W. LODGE, 31st Pennsylvania volunteers—*Camp diarrhœa*, Med. and Surg. Reporter, Vol. VI, 1861, p. 566—who explains the painless watery diarrhœas which were common in his regiment in September, 1861, as follows: "I believe that the principal cause is exposure to alternations of temperature while on sentinel duty at night. During a relief of two hours, the sentry is warmly housed in his tent; when his hour of duty arrives, he is aroused from sleep, and enters upon his duty and exposure. Occasionally, even during summer these alternations are of an impressive character" &c. He explains the exemption of the officers by the fact that they do not perform sentry duty.

Influences of the class under discussion were elevated by Wilson, Akenside, Moseley, and especially by Stoll* and his school to the rank of the principal cause of dysentery, but this is altogether too exclusive a view. Taking cold can only be regarded as one of the exciting causes of diarrhœa and dysentery, and by no means as the chief. As to the mode in which this cause acts, there is no reason to regard it as essentially diverse from that by which similar exposures produce bronchial catarrhs and other inflammatory affections of the respiratory organs. The speculation of Treitz† that it acts primarily on the kidneys, is not warranted by actual observation. Nor is it probable that, as was formerly believed, it acts by the mere suppression of the cutaneous secretion and the consequent accumulation in the blood of noxious matters which the bronchial or intestinal mucous membrane attempts to excrete. The effects actually observed after complete suppression of the cutaneous secretion, brought about by varnishing the skin of animals, are of a very different nature.‡ The view that the impression produced on the peripheral nerves gives rise to disturbances of the nutrition and circulation of the internal organs through a reflex action propagated by the vaso-motor nerves seems the most reasonable, but must be regarded rather as an ingenious conjecture than as a positively established theory. Observation seems to render it probable that chilling the abdominal surface, as may occur from sleeping on the cold ground, is especially apt to give rise to alvine fluxes, while chilling the upper part of the body causes inflammations of the respiratory organs. The common belief that this is the case has given rise to the recommendation that a flannel bandage shall be worn over the abdomen by soldiers in campaign. But, besides the different effects of exposure that may be supposed to be determined in this way, and those resulting from the previous existence of pathological conditions in various parts of the body, to which I have already alluded, it seems probable that respiratory inflammations are especially prone to result from taking cold when the range of temperature is very low, the fluxes when the minimum temperature is more moderate; hence the former are more commonly produced during the winter months, the latter during the summer and autumn.

As for the consequences of other meteorological conditions, such as variations in the barometrical pressure, the condition of the atmospheric electricity and the quantity of ozone, nothing positive is known, and I will not, therefore, take space to discuss the opinions that have been advanced by some writers on these points. There is, however, one other probable occasional cause, which should be alluded to in this place: I refer to the contamination of the atmosphere with non-specific but putrid emanations from decomposing animal matter. Such emanations may arise from battle-fields when the dead lie unburied or are imperfectly covered in shallow trenches. Already Galen speaks of this circumstance as a cause of pestilence,§ but the number of observations which clearly connect it with the causation of the alvine fluxes is not very great. Fournier and Vaidy ‖ relate a striking incident which occurred in August, 1796, and strongly supports this view. It is probable that during our

* See the references to WILSON, AKENSIDE, MOSELEY, STOLL and his followers, in the notes to p. 342, *supra*.

† See p. 386, *supra*.

‡ See the discussion of the subject of taking cold, in the work of E. WAGNER—*Manual of General Pathology*, Amer. Transl., New York, 1876, p. 61 *et seq.*—where references will be found to the literature of the experiments referred to in the text.

§ See note to p. 644, *infra*.

‖ FOURNIER *et* VAIDY—p. 332, *op. cit.*, p. 362, *supra*. "After a "warm affair" between Bamberg and Nuremberg, in August, 1796, the French army was victorious, pursued the enemy and left the dead unburied. On the fourth day one of the authors was sent to superintend their burial. He took four gendarmes with him and made some neighboring villagers bury the bodies. There were about 400 dead men and 200 dead horses. The odor was insupportable. Yet the surgeon sat on his horse, in spite of the nausea and colic he felt, and the restlessness of his animal, to encourage the villagers in their sad task. On returning to headquarters the surgeon and two of the gendarmes had a dysenteric flux, from which, however, they recovered in a few days. The horse died of colic the night of his return. What became of the villagers was not learned.

civil war this cause came occasionally into operation, but not very frequently, owing to the care with which the dead were usually buried; I find mention of it only in connection with the battle fields of Fair Oaks and Cold Harbor.* Under any other circumstances the effluvia of putrefying dead bodies appear to be capable of producing similar results. Desault† frequently said during his lectures on anatomy that the odor of putrid cadavers always gave him diarrhœa. Broussais‡ mentioned it as a well known fact that anatomical students often suffer from diarrhœa when they commence to frequent the amphitheatres. I myself have had this unpleasant experience more than once during my early anatomical studies, and suppose similar accidents to be far from uncommon. The effluvia which rise from fæcal accumulations may produce like effects; according to the testimony of Greenhow,§ this is a common cause of diarrhœal diseases in England, and the observations of Clouston‖ would seem to show that it may also give rise to dysentery. In this group of cases it is difficult to exclude the possibility of the presence of some specific contagion, a subject to which I shall refer further on; in all the others the effluvia appear to produce diarrhœa rather than dysentery; yet of course it must always be possible that the diarrhœa thus produced may, from the action of constitutional or other coöperating causes, ultimately pass into catarrhal or even into diphtheritic dysentery.

ENDEMIC AND EPIDEMIC INFLUENCES.—It must, however, be admitted that the conditions hitherto considered are insufficient to explain all the phenomena of the occurrence of the alvine fluxes. Especially are difficulties presented by the facts relating to the endemic and epidemic occurrence of dysentery. In addition to the considerations already discussed, the geological formation of the affected locality has been invoked. This suggestion gained strength at the commencement of the present century from the statement of Harris,¶ that the dysentery which prevailed in Mifflin county, Pennsylvania, during the summer and fall of 1797, 1798 and 1799, spared the inhabitants of those districts in which the soil rested on a limestone formation. Other observations have been reported that seemed to support this view. Thus Godineau** has affirmed that in the French Antilles the volcanic islands are ravaged by dysentery, while those of limestone formation escape. But experience has abundantly shown, as has been pointed out by Hirsch†† and others, that limestone districts enjoy no such fortunate immunity; and the general conclusion that must be drawn from the history of the epidemic and endemic prevalence of dysentery is that no definite relation exists between the geological formation and the occurrence of the disease.

* Assistant Surgeon H. E. BROWN, U. S. A.—p. 77, Appendix to Part I of this History, and p. 72, Section II, *supra*—reports that the effluvia from the battle-ground at Fair Oaks, and the impregnation of the surface water drunk, produced typhoid diarrhœa and dysentery among the troops there encamped. "Over 3000 dead had been buried there; the ground was covered with the remains of clothing and commissary stores. Dead horses, which had been but insufficiently buried or burnt, filled the air with a noxious effluvium, and the only water was that obtained from the surface, or by digging down a few feet, and this infiltrated with the decaying animal matter of the battle field." Surgeon MCKELWAY—p. 76, *supra*—draws a still more deplorable picture of the same battle field, describing the dead within the lines as "lying on the surface of the ground with but a sprinkling of earth thrown on them, while immediately without the dead bodies of men and horses were quite exposed or but slightly covered with brush; * * * diarrhœa and dysentery became more rife." Medical Director MCPAULIN reports—p. 161, Appendix to Part I—that in the early part of June, 1864, after the battle of Cold Harbor, "dead horses and offal of various kinds were scattered over the country everywhere, and between the lines were many dead bodies of both parties, unburied and decomposing in the burning sun." He reported to the Commanding General, June 5th, "sickness is increasing in the army, diarrhœa being especially prevalent."

† I borrow this statement from FOURNIER *et* VAIDY, p. 333, *op. cit.*, p. 362, *supra*.

‡ BROUSSAIS—*Hist. des Phlegmasies*, 3me Éd., Paris, 1822, T. III, p. 24.

§ GREENHOW—*loc. cit.*, p. 613, *supra*.

‖ CLOUSTON—*op. cit.*, note † to p. 438, *supra*, at the end of the note. I will discuss the particulars of this observation a little further on.

¶ WM. HARRIS—*Facts relative to the black vomit, dysentery, &c., as they occurred in Mifflin county, Pennsylvania, during the hot weather of 1797, 1798 and 1799, and to the efficacy of strata of calcareous earth (carbonate of lime) in counteracting the exciting causes of those distempers*, Medical Repository, New York, Vol. IV, 1801, p. 105.

** GODINEAU—*De l'hygiène des troupes aux Antilles Françaises*, Montpellier, 1844. I have not seen this work, and cite from BOUDIN—*Études, etc., sur l'état sanitaire et la mortalité des armées de terre et de mer*, Annales d'Hygiène, T. XXXVI, 1846, p. 98.

†† HIRSCH—Bd II, S. 238, *op. cit.*, p. 551, *supra*. Compare BARRALLIER—p. 717, *op. cit.*, p. 603, *supra*; and SAVIGNAC—p. 12, *op. cit.*, p. 620, *supra*.

Nowhere is this better illustrated than in the case of the distribution of dysentery among the civil population of the United States, the most important facts with regard to which I have presented in a previous portion of this Section;* neither in its ordinary distribution nor in its epidemic prevalence has it borne any relation to geological formation in this country. There remains, therefore, it is confessed on every hand, a certain *quid ignotum* to which we must appeal in explaining the phenomena of the endemic and epidemic prevalence of dysentery. It would be as unreasonable to deny this as to place any confidence in the conjectures which have been advanced as to its nature. Two possibilities have here to be considered: The existence of some local or wide-spread influence operating simultaneously on many individuals, and the transfer of the disease from individual to individual by actual contagion.

The development in the atmosphere of various morbific miasmata, some especially hostile to plants or the lower animals, others to man, was assumed already by the Greek physicians† to explain the phenomena of pestilential diseases. Galen expounded this subject with his usual ingenuity.‡ According to him the miasmata were of a putrid nature, and might arise either from animal or vegetable decomposition, or from the action of heat and moisture on the ordinary constituents of the air; genuine *semina morborum* were thus produced, which were introduced into the economy chiefly by the respiratory act, and generated disease by exciting putrefaction in the humors of those exposed; this effect, however, does not result indifferently in all subjects, but only in those whose constitution, habits of life or previous morbid conditions favor the putrefaction of the humors. These fundamental notions as to the origin of epidemic and endemic diseases in general were long received by the physicians of modern Europe as a part of the humoral pathology. Accordingly it is by no means surprising to find them reappear from time to time with but little modification, in the various special treatises on dysentery, in explanation of the epidemic occurrence of that disease.

I may refer to the tracts of Fabricius Hildanus and Sennertus in illustration of the views which were dominant at the commencement of the seventeenth century. According to Hildanus,§ corruption of the air is the most dangerous of the external causes of dysentery. The epidemic of 1601–3 was preceded and accompanied by an excess of vapors and exhalations in the air, so that the sun, especially just after sunrise, was almost daily pallid and smoky. Then there were two earthquakes in the year 1600, one on the 8th of March, the other on the 7th of September, by which great quantities of corrupted vapors were emitted from the bowels of the earth. The air itself was infected by the putrefaction of

* Page 418 *et seq.*, *supra*.

† Thus, in the Hippocratic treatise *De Flatibus*, § 5-6, [Ed. Littré, VI, p. 96,] the air is said to be a source of disease when it is corrupted by morbific miasmata, (*νοσερὰ μιάσματα*,) and again, that when the air is infected by miasmata hostile to human nature men are smitten, but animals when the miasm is out of harmony with their nature.

‡ GALEN expounds the doctrine in the text most fully in his work *De Diff. Feb.*, Lib. I, Cap. 6, [Ed. Kühn, VII, p. 289.] Pestilential diseases are chiefly caused by breathing air infected with a putrid exhalation, (*σηπεδονώδης ἀναθυμίασις.*) As a source of such exhalations of animal origin he mentions the putrefaction of human bodies in time of war, but he was well acquainted with another important source, viz: city sewers, which he elsewhere—*Comm. III, in Hippoc. de Humor. Lib.*, § 3, [Ed. Kühn, XVI, p. 357,]—speaks of as corrupting the air and causing diseases. He also specifies the exhalations from marshes and stagnant water in summer. These exhalations constitute genuine *semina morborum*, (*λοιμοῦ σπέρματα*,) which, however, are limited in their action, as mentioned in the text. As an example of immoderate heat alone generating pestilence, he cites the account given by THUCYDIDES of the plague at Athens, whom he represents as saying that "it affected with corruption the bodies of men living in summer time in suffocating ill-ventilated huts;" to which GALEN adds that the pestilence began as a fever, because the humors of the body were prepared for putrefaction by bad food, and that perhaps also it happened because the air which blows from Ethiopia contained putrid miasmata (*σηπεδονώδη μιάσματα*) that caused fever in those predisposed; for he declares this should be especially remembered, that no cause can produce disease unless there is also a certain aptitude of body in those exposed to it. The account given by THUCYDIDES of this plague will be found in his *History*, Lib. II, Cap. 47–54; the passage cited by GALEN is in Cap. 52. THUCYDIDES declined to express an opinion as to the cause of the pestilence, saying that he would leave that question to others, whether physicians or unprofessional persons. An excellent though brief summary of the Galenical doctrine of epidemic and endemic diseases will be found in ÆTIUS—Tetrab. II, Serm. I, Cap. 94, Lyons Ed., 1549, p. 268.

§ FAB. HILDANUS—*De Dysenteria*, [1602,] in Opera, Frankfort, 1646, p. 669.

these exhalations and vapors, and this condition produced the epidemic. According to Sennertus,* atmospheric moisture is not necessary to the generation of the cause of dysentery, for the epidemic of 1624 broke out after an unusually hot and dry spring and early summer. Moreover, it is impossible to explain the constitution of the air which produces dysentery by merely considering heat, moisture, and other natural qualities. Something more must be invoked: Perhaps the occult qualities of the constellations and planets may generate the morbific influence. Be this as it may, the atmospheric impurities which result do not appear to infect the whole air, but rather to be scattered in certain tracts; and this circumstance, as well as the greater susceptibilities of some individuals, must be considered in interpreting the fact that all persons do not suffer from the disease during its epidemic prevalence. Such generalities as these paved the way for the conception of a special dysenteric miasma, which we find in the writings of Selle and Kreysig,† and in a modified form in the doctrine of a mephitis related to crowd-poisoning, developed in the monograph of Vogt.‡

More recently Niemeyer§ has taught that dysentery is an infectious disease in the sense that it depends upon a miasma, the germs of which are capable of growing and multiplying independently of the presence of the human organism. A high temperature and a certain degree of moisture are the most important conditions of the multiplication of these germs. Hence the disease is endemic throughout extensive districts in the tropics, while in Europe the necessary conditions are only occasionally present. Moreover, these germs are capable, under favorable circumstances, of multiplying in the bodies of the infected individuals, whose stools, hence, contain the germs of the disease either fully developed or in some preliminary stage. This view has been widely accepted in Europe and America. Heubner‖ has adopted a very similar opinion, dwelling, however, also upon the importance of a moist and swampy soil as a favorable condition, and upon a similarity between the dysenteric miasm and that which causes the malarial fevers.

But if we are to assume a special dysenteric miasm, we should at least endow it with characters that will account for all epidemics. Niemeyer himself felt some of the difficulties of his doctrine; for he acknowledges that dysentery does not always prevail when the requisite heat and moisture are present, and points out that this may be either because yet other conditions are indispensable, or because the dysenteric germs are not universally diffused, and their presence is indispensable as a starting point for their subsequent multiplication. But these are not the only difficulties surrounding the doctrine of a dysenteric miasm which requires heat and moisture as essential conditions. Such a view utterly fails to account for the epidemics that occur in winter,¶ or for the fact that the local outbreaks which occur during epidemic years in temperate climates bear no relation to the moisture

* D. SENNERTUS—*Tractatus de Dysenteria*, Wittemberg, 1626, p. 26; also *Pract. Med.*, Lib. III, Part. 2, Sect. 2, Cap. 7, Opera, Paris, 1641, T. III, p. 126. Elsewhere—*De Febribus*, (1619,) Lib. IV, Cap. 2, *op. cit.*, T. II, p. 685—he expresses in a more general way his belief that the stars are capable of generating various pestilential miasmata, and that the plagues thus produced are the severest and most widely diffused to which man is subject.

† C. G. SELLE—*Medicina Clinica*, Vienna, 1797, S. 139: "The cause of this disease is a special *miasma epidemicum* which causes in the intestines a sort of catarrh." F. L. KREYSIG—*De pecul. in dysenter. epidem. miasmat. præsentia et de iis, quæ id augere et propagare possunt*, Wittemberg, 1799: I have not seen this essay, and cite from NAUMANN—*Handb. der med. Klinik*, Bd. IV, 2, 1835, S. 41—who remarks: "It is difficult to give a definite idea of this miasma, concerning which, moreover, obscure and contradictory opinions are expressed."

‡ P. F. W. VOGT—*Monographie der Ruhr*, Giessen, 1856, p. 13 *et seq.*

§ F. v. NIEMEYER—*Lehrb. der Spec. Path. u. Ther.*, 7te Aufl., Berlin, 1868, Bd. II, S. 747: "Die Ruhr ist eine Infectionskrankheit, sie unterscheidet sich aber von dem Typhus und anderen Infectionskrankheiten dadurch, dass die Infection mit Ruhrgift nur im Darmkanal zu nachweisbaren pathologischen Veränderungen führt." He speaks here exclusively of diphtheritic dysentery, the only cause of which, according to him, is this infection: "Nichtsdestoweniger ist die Infection mit dem specifischen Gift die einzige Ursache der in Rede stehenden Krankheit." Catching cold, the use of unripe fruit, &c., only predispose the individual by making him more sensitive to the action of the poison, if he encounters it. He strongly inclines to the belief that the specific "Ruhrkeim" consists of specific lower organisms.

‖ S. 509, *op. cit.*, p. 529, *supra*. ¶ See p. 430, *supra*.

or swampy character of the soil, or to the distribution of the malarial fevers.* Heubner† has especially emphasized the circumstance that during the Franco-German war dysentery was epidemic chiefly in the camps around Paris and Metz, places already known to have been infested with endemic intermittent fever or dysentery. But these were the chief camps of the German army in that war; had their armies moved elsewhere in hostile array I suppose dysentery would have followed them wherever they went. Certainly in our own civil war, although, as has already been shown in detail, the malarial regions suffered most, no district in which troops were massed for war purposes was exempt from the scourge.‡

As to the intimate constitution of the dysenteric miasm, no satisfactory explanation has been offered. The various animal and vegetable germ theories have already been referred to in sufficient detail.§ It seems wiser to confess our ignorance of this unknown factor of disease than to embrace the undemonstrated hypotheses that have been brought forward. In this respect we might advantageously imitate the example of Sennertus,‖ who openly confessed, when he brought forward his speculation as to occult qualities, that it was the last asylum of human ignorance.

CONTAGION.—Is dysentery contagious?¶ Does the dysenteric subject generate in his intestinal mucous membrane, or elsewhere, a virus capable of causing the disease in others, if brought in contact with them by the air, the drinking water, or otherwise? These questions were answered in the affirmative for the malignant forms of dysentery by many of

* See the account given—*supra*, p. 48 *et seq.*—of the distribution of dysentery among the civil population of the United States; also the passages in the works of HIRSCH, DUTROULAU and others, cited on p. 401, *supra*.

† HEUBNER—*loc. cit.*—also brings forward, in support of his view that camp dysentery is always dependent on situation, PRINGLE'S story of the battle of Dettingen, concerning which I have already exposed his error—note ‖, p. 640, *supra*—and a statement which he attributes to MURSINNA, "that while the army of Prince Henry of Hesse was encamped at Nimes in Bohemia, in 1778, dysentery raged fearfully; but when the army moved to Leutmeritz, the disease immediately ceased, though the soldiers ate large quantities of fruit." Hence, HEUBNER affirms that camp dysentery "develops itself only in such places as are peculiarly predisposed to it, as is expressly emphasized by military authors, (Pringle and Mursinna.)" But it is not the military authors who have emphasized this view; it is HEUBNER himself, and he is no more fortunate in his citation from MURSINNA than in that from PRINGLE. I read in the work of MURSINNA—*Beob. über die Ruhr und die Faulfieber*, 2te Aufl., Berlin, 1787, Cap. 5, S. 86—that the army of Prince Henry reached Nimes, and encamped in its neighborhood, August 9, 1778. Here the weather was very hot and dry, (S. 98,) but for the first week the troops remained well, although some mild diarrhœas made their appearance. Afterwards persistent rainy weather set in, and it is to this circumstance, and not to the situation of the camp, that MURSINNA attributed the dysentery. He says: "Whoever has accompanied a campaign and lain in camp, especially if he is a practical physician, will know how much misery (Ungemach) such continuous bad weather causes; how many diseases are speedily produced by it among men and cattle, and how easily these become malignant. So it was now. There speedily arose a really putrid dysentery throughout the whole army." And he goes on to compare the weather on this occasion with that which accompanied the epidemic of 1779, at Herford, in Westphalia, described in a previous portion of his book, and expresses the opinion that the cause of the dysentery is to be found in the weather, on both occasions. September 12th, less than a month after the dysentery broke out, the army moved to Leutmeritz, after which very little dysentery occurred. Perhaps the cause of this was as much change of diet as change of camp. MURSINNA writes: "Fresh fruit was not to be had at Nimes, and all got sick. So soon as the army, on the 12th of September, encamped at Leutmeritz, we found the most splendid fruit, especially grapes in abundance, and all remained well, (S. 114.)" The fact brought forward by HEUBNER in the same connection—*op. cit.*, p. 507—that a marked improvement has frequently been noticed in the dysentery cases when a camp hospital has been moved from an unfavorable place, is often due chiefly to the circumstance that the sick are thus removed from the accumulated filth, contaminated privies, &c. I do not wish to be regarded as denying the influence of location on camp dysentery, but think that HEUBNER has exaggerated its connection with the etiology.

‡ See p. 9 *et seq.*, p. 290 *et seq.* and p. 414 *et seq.* § See p. 278 *et seq.* and p. 367 *et seq.*

‖ SENNERTUS—*Pract. Med., loc. cit.*, last page: "Ideoque malo in hisce et aliis morbis eorumque causis ad necessarium illud in hac humanæ mentis caligine ignorantiæ asylum, occultas qualitates, confugere, et causas veras saltem nominare, si eas non satis explicare possum, quam falsas ac fictas afferre, quod nonnulli hodie faciunt, qui ut Antiquitatis egregii Patroni et defensores videantur, vanissime et irrito conatu omnia ad qualitates prima deducere, et incerta per æque incerta probare conantur." In the like spirit, about the close of the seventeenth century, BAGLIVI wrote—*Prax. Med.*, Lyons, 1699, Lib. II, Cap. 9, p. 231: "In morbis cuim, sive acutis, sive chronicis producendis, viget occultum quid, per humanas speculationes fere incomprehensibile." These expressions may well be commended to the consideration of modern medical speculators, who too often fall into the error, censured by SENNERTUS, of endeavoring to explain uncertain things by others equally uncertain.

¶ I use the word contagion in the same sense in which it was employed by SENNERTUS, who defined it as follows—*De Febribus*, Lib. IV, Cap. 3, Opera, Paris, 1641, T. II, p. 688: "Unde definimus contagium esse *μίασμα* seu seminium vitiosum, e corpore ægro emissum, quod in analogo corpore receptum, similem in eo morbum gignere et producere aptum natum est." According to SENNERTUS, the substance thus emitted by the sick body, and producing disease in another, may either be of a gaseous or fluid nature: "Semen hoc corpus quoddam est, sed nunc spirituale, nunc etiam humoris natura præditum;" and he declares it to act like a ferment: "Habetque *μίασμα* hoc se iostar fermenti, quod alteri massæ non fermentatæ mistum facit, ut et ipsa effervescat." This latter notion is the basis of the modern doctrine of zymotic diseases. I take from SENNERTUS neither this notion, which is now pretty thoroughly exploded, nor his belief that the contagious body may be a gas, for the facts with regard to contagion seem to be intelligible only on the supposition that it is particulate. But neither of these notions are essential to the definition given above. In this sense the word contagion is used by most of the best modern authors. Some unsuccessful attempts have been made on the one hand to limit it to diseases in which the contagion is not diffused through the air, *e. g.*, syphilis; on the other hand to extend it to embrace the atmospheric influences producing epidemic or endemic diseases, *e. g.*, the malarial fevers, which are not transferable from individual to individual. These latter affections are very often spoken of as infectious, and their cause designated infection, terms which are used by different writers in very different senses. Thus, according to G. B. WOOD—*Treatise on the Practice*

the physicians of the sixteenth and seventeenth centuries. Helidæus of Padua* declared that he had often seen dysentery communicated by the use of clyster pipes previously used in the treatment of those suffering from that disease and not properly cleaned. Horstius and Fabricius Hildanus† taught that the contagion is not produced by the whole body of those laboring under dysentery, but is a specific and malignant corruption of the humors generated by the ulcerated intestine; the use of latrines contaminated by dysenteric excreta is therefore particularly dangerous. Sennertus‡ held similar views, but not so exclusively; according to him it often happens in dysentery that the whole mass of the blood becomes contaminated, and hence he insists that those using the beds or eating utensils of such patients, or breathing the same air, may be infected, even though they do not use the same privies. Frid. Hoffmann,§ on the other hand, adhered quite closely to the doctrine of Horstius, and Van Swieten‖ took nearly the same view, declaring that those who wash bedlinen soiled by the dysenteric discharges are attacked by the disease, and that physicians may contract it while examining the dysenteric stools, which give off malignant exhalations.

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*of Medicine*, 6th Ed., Philadelphia, 1866, Vol. I, p. 183—they are usually applied to those contagious diseases which are transmitted from individual to individual through the air, while "Chemel confines it to the action of the morbific exhalation which arises from the person, when numbers, either in health or sickness, are crowded together," and remarks: "In this confusion of meaning, it is best to abandon the terms infection and infectious altogether, especially as we can express all that is essential without them." The definition of contagion given by DUNGLISON—*Dict. of Med. Sci.*, new Ed., revised by his son, Philadelphia, 1874, p. 250—agrees with that of SENNERTUS and WOOD, but he adds: "Contagion and infection are generally esteemed synonymous." In like manner AITKEN—*Science and Practice of Medicine*, 3d Am. Ed., Philadelphia, 1872, Vol. I, p. 751—remarks: "Considerable confusion has always pertained to the use of these terms, contagion and infection; but when observations like those of Drs. Chauveau and Burdon Sanderson can demonstrate that the essential poison-carrying substance is a germ or granule of minute microscopic size, capable of indefinite growth and multiplication, when it comes in contact with suitable soil, the contagiousness of infecting miasms becomes quite intelligible, and the one word becomes synonymous with the other." LITTRÉ et ROBIN—*Dict. de Méd.*, Paris, 1865, p. 346—define contagion as "Transmission de la maladie d'un individu à un autre par l effet d'un contact médiat ou immédiat." GALLARD—Art. *Contagion*, Nouv. Dict. de Méd. et de Chir. Pratiques, T. IX, Paris, 1869, p. 210 *et seq.*—gives essentially the same definition, and explains that mediate contact can operate, A, through persons, B, through things, C, through the atmospheric air; (an excellent bibliography will be found at the close of this article.) LITTRÉ et ROBIN—*op. cit.*, p. 782—define infection to be the action exercised on the economy by morbific miasms. It differs from contagion in that the latter can reproduce itself indefinitely; while infection, due to the action of putrefying animal and vegetable substances on the surrounding air, only acts in the neighborhood whence the morbific miasms arise. Infection can, it is true, propagate itself from individual to individual like contagion, but this is not by contact; it is by altering the surrounding air, in relation to which the diseased individual plays the role of a focus of infection. Still another broader use of the term infection has lately come into use in Germany, by which it is employed as a generic term to embrace both contagion and the unknown cause of the non-transmissible endemic and epidemic diseases. An interesting exposition of this view has been given by LIEBERMEISTER—*Einleitung zu den Infectionskrankheiten*, Ziemssen's Handb., Ed. II, Th. 1, S. 3 *et seq.*; also Amer. Transl., Vol. I, p. 1 *et seq.*—to whose work I refer the reader. He divides infectious diseases into: 1. Those that are purely contagious; 2, those that are purely miasmatic; and 3, miasmatic contagious diseases. Under the first head he embraces measles, scarlet fever, &c.; under the second, the malarial diseases; under the third, "cholera, typhoid fever, dysentery, and probably, also, yellow fever and the plague." These diseases he believes are not transmitted from individual to individual, and are the result of a miasm generated outside of the body, which, however, is only generated if an individual suffering from the diseases furnishes the necessary germ.

* HELIDÆUS of PADUA; see note ‡, p. 538, *supra*, with regard to the time when this physician flourished. I borrow this statement from ETTMÜLLER—*De Morb. Human. Corporis in Genere*, Cap. 9, p. 125, in Opera, Lyons, 1690, T. I: "Sed etiam notatu dignum est quod observat Helidæus Paduanus in *observat.* p. 104. per clysteres etiam communes oriri dysenteriam: dicit enim hinc videmus sæpius dysenteria corripi eos, quibus clyster infunditur instrumento non bene abluto, quo antea dysentericus fuit usus."

† GREGORIUS HORSTIUS—*De Morbis eorumque Causis, Lib.*, Giessen, 1612, Exercit. 5, Quæstio 13; I have not seen this work, and give the reference from HILDANUS—*loc. cit., infra*. The passage is reprinted in the Opera Medica of HORSTIUS, Nuremberg, 1660, T. I, p. 274: "In dysenteria malignitatem adesse, non respectu totius, quia morbus hic universalis non est, sed ratione specificæ et malignæ corruptionis illorum humorum, qui intestinorum exulcerationem fœtidam generarunt. Quatenus autem hæc corruptio specifica singulari quidam parti, nimirum intestinis, et non simpliciter toti contraria est et inimica, eatenus facillime recipitur et vim suam exerit tum temporis, ubi quis aliquo modo dispositus ad cloacas ægrotantium accedens per inferiorem gutturem (ut Plautus loquitur) venenatas expirationes excretorum recipit." HILDANUS—p. 671, *op. cit.*, p. 641, *supra*—cites this passage to express his own views, remarking: "Familiaritas quoque et conversatio ægrotis, et præcipue latrinarum usus cum iis communis, periculosus est, et facillime inficit."

‡ SENNERTUS—T. III, p. 127, *op. cit.*, p. 645, *supra*—expresses essentially the same views as HORSTIUS and HILDANUS but insists on other modes of contagion besides the excreta, remarking: "Quia tamen in dysenteria non solum alvus afficitur, ut in ophthalmia et phthisi pars una reliquis salvis afficitur, sed sæpe tota massa sanguinea inquinata est (unde etiam febres dysenteriæ sæpe conjungnntur) nec conversationem cum dysentericis satis tutam puto, et dysenteriam ex lecto dysenterico communi vel communibus poculis aut patinis aut ære inspirato attrahi posse existimo; cum experientia doceat, non paucos ex conversatione cum dysentericis in dysenteriam incidisse, qui nunquam in locum communem alvum exonerarunt." According to OZANAM—T. III, p. 281, *op. cit.*, p. 609, *supra*—the Lyons epidemic of 1624–5 was described by JEAN DE LAMONÈRE—*Obs. Fluxus Dysenterici*, &c., Lyons, 1626; a work I have been unable to see—as decidedly contagious; the physicians, apothecaries and others who visited the sick were attacked by the disease.

§ FRID. HOFFMANN—*Med. Rat. Syst.*, T. II, Pars 2, Cap. 3, De venenis corporis humani, § 20, Scholion, Opera, T. I, Geneva, 1740, p. 295: "Puruleutus dysentericorum fluxus effluvia spargit, quæ uno excepta, præsertim si quis eædem sellæ insideat, intestinorum tunicas petunt, et fœtidissimum hunc morbum pariunt. Ex veteri pulmonum ulcere ere suscepti halitus corruptivæ labi pulmonibus inferendæ aptissimi sunt." In the same scholion he declares that the materia from scabies reproduces disease of the skin, and that from gonorrhœa or lues venerea is especially injurious to the genital organs. We well know at the present time the error of such generalizations.

‖ G. VAN SWIETEN—*Comm. in H. Boerhaave Aphorismos*, T. II, Leyden, 1745, § 722 ad fin., p. 395. He mentions that a distinguished physician of his acquaintance contracted the disease from examining the stools of a patient. The same author—in his *Kurze Beschreibung und Heilungsart der Krankheiten welche am öftesten in dem Feldlager beobachtet werden*, Vienna, 1758 p. 108—declares that in camps the healthy soldiers are speedily infected, by the foul exhalations which rise from the fecal matters, if they use the same sinks as the sick.

Not a few subsequent observers maintained the contagious character of dysentery in the same broad manner in which it was taught by Sennertus. Degner* not merely declared that the disease spread from street to street through Nimeguen, but that the physicians who attended the sick contracted it from them. Pringle† affirmed that in camps the contagion passes from one who is ill to his companions in the same tent, and thence to those in the next. Tissot‡ asserted that if there be a truly contagious disease it is dysentery, and related a striking incident in support of his opinion. Cullen§ lent to this view the support of his great authority. The dreadful epidemic of dysentery which decimated the army of the allies after the battle of Valmy, September 20, 1792, and has been described in detail by Chamseru and Montgarny,‖ seemed to afford ghastly evidence in its favor; this dysentery was highly contagious, and speedily spread to the victorious French army and the miserable population of the towns and villages through which the beaten army passed in its retreat; long after, it was known in France as the Courrée prussienne. According to Gilbert,¶ the epidemic dysentery of the great French Army during the campaign of 1807, in Prussia and Poland, was also highly contagious: it spread from bed to bed; the straw on which the sick lay became infectious; the physicians who merely examined the discharges for a moment were smitten with the disease.

It would be easy to multiply authorities in favor of the contagion of dysentery, and to cite additional instances of particular outbreaks which appear to support this view.** The first authoritative voice which was raised against it was that of Stoll,†† whose views of the pathology of the disease led him to deny contagion in toto, and who declared that in the Vienna hospital it was never communicated to the physicians or hospital attendants. This opinion was shared by almost all of those who accepted the catarrhal origin of dysentery.‡‡ Others, more conservative, held with Zimmermann§§ that dysentery is contagious or non-contagious according to circumstances; after the excrements acquire a cadaverous smell, in fatal cases, they become contagious; and so also where many persons are sick at

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* DEGNER—p. 3 *et seq.* and p. 94 *et seq.*, *op. cit.*, p. 625, *supra*. He went so far as to express the opinion that the whole epidemic originated from a single case, and regarded it as a general possibility, "ut ab uno ægroto integra civitas imo regio possit infici."

† PRINGLE—Part III, Chap. 6, p. 254, *op. cit.*, p. 640, *supra*. He adds: "The foul straw becomes infectious. But the greatest sources of infection are the privies, after they have received the dysenteric excrements of those who first sicken. The hospitals likewise spread it; since those who are admitted with the flux, not only give it to the rest of the patients, but to the nurses and other attendants of the sick." Further on he remarks: "The infection is carried from one to another by the effluvia, or clothes, or bedding, &c., of the tainted person, as in the case of the plague, small-pox and measles. Yet the dysenteric miasma is of a less catching nature than any of those; so that in the milder epidemics it may pass unnoticed."

‡ TISSOT—*Avis au Peuple sur sa Santé*, (1761,) Chap. 24, T. III, p. 28, Ed. cited p. 625, *supra:* "S'il y a une maladie véritablement contagieuse, c'est celle ci." A family of six persons lived in a healthy country house, in the vicinity of which no dysentery prevailed. One of their sons returned from Holland, where he had been a soldier, in bad health, and shortly after his arrival was attacked by dysentery. One after the other of the whole family contracted the disease, and two of them died. In the same chapter (p. 16) TISSOT declares, "les excrémens sont très-contagieux."

§ CULLEN—*First Lines*, § 1675, Thomsen's Ed. of Works, Vol. II, Edinburgh, 1827, p. 321: "The dysentery does often manifestly arise from the application of cold, but the disease is always contagious; and, by the propagation of such contagion, independent of cold, or other exciting causes, it becomes epidemic in camps and other places."

‖ CHAMSERU—*Exposé des maladies qui ont régné dans les hôpitaux ambulans à la suite de l'armée de réserve pendant l'été et l'automne de* 1792, Jour. de Méd. Chir. et Pharm., T. 95, 1793, p. 27 *et seq.*, and 173 *et seq.* The essay of HARMAND DE MONTGARNY—*Hist. médico-pratique du flux dyssentérique, appelée Courrée prussienne*, Verdun, 1793—I have not been able to see. There is a pretty good abstract of it in the work of F. MARÉCHAL—*Tableau, etc. des Maladies Endémiques, Épidémiques et Contagieuses, qui ont régné à Metz et dans le Pays-Messin*, Metz, 1850, p. 283 *et seq.* See also OZANAM—T. III, p. 302 *et seq.*, *op. cit.*, p. 647, *supra*. This dysentery and the contagious typhus with which it was associated may be said to have destroyed the allied army, which, according to OZANAM—p. 303—lost one-half of its men and horses during the twenty-two days of the retreat.

¶ N. P. GILBERT—*Tableau Hist. des Malodies, etc., qui ont affligé la Grande Armée dans la campagne de Prusse et de Pologne*, Berlin, 1808; I have not been able to see a copy of the original, but quote from the German translation of Beck, Erfurt, 1808, S. 52. GILBERT declares that contagion was the most important cause of the disease.

** A number of interesting facts of this kind have been collected by FOURNIER et VAIDY—p. 334 *et seq.*, *op. cit.*, p. 362, *supra*.

†† MAX STOLL—p. 327, *op. cit.*, note †, p. 342, *supra*—"Contagium dysentericum pauci in dubium vocarunt, idque effluvium ex uno homine expirans communicari adstantibus posse, plerique credunt. Miror Hercle, qui nos immunes per omnes hos annos a dysenteria manserimus, medici, medicorum adjutores, et ægrorum custodes. Atqui quotidie manu singulorum fæces lustramus ea nocte exceptas, et vel inviti haurimus putidissima effluvia totis naribus." He admitted that the dejecta of dysentery corrupted the air, and might cause putrid diseases, especially hospital diseases, but not dysentery.

‡‡ For example, MOSELEY—*Treatise on Tropical Diseases*, 3d Ed., London, 1792, p. 267—writes: "As to contagion from infection in the dysentery, I must confess I never saw an instance of it: neither do I believe there is any such thing. But this is a field for speculation, that has long amused the pedantry of the schools, and should never be entered by practical writers."

§§ ZIMMERMANN—*Von der Ruhr unter dem Volke*, Zurich, 1767, S. 342.

the same time, and their putrid excrements accumulate without proper precautions b ing taken, contagion arises. Zimmermann admitted that the bedding and clothes of dysenteric subjects might communicate the disease, but according to Van Geuns* this was not the case in the Harlingen epidemic of 1783; and Mursinna,† who believed the camp dysentery at Nimes to be contagious, declared that during the epidemic at Herford, in 1779, neither clothing nor individuals transmitted the disease, and that the physicians, clergymen and nurses who attended the sick were not infected. Pinel,‡ who held, like Zimmermann, that dysentery is not constantly contagious, suggested its complication with some contagious adynamic fever as one of the circumstances that might render it so. Harty,§ likewise, declared that it is only when combined with typhus that dysentery is contagious, and a similar view was maintained by Broussais‖ in explanation of at least those cases in which the contagion appears to be at all energetic.

On the other hand, Fournier and Vaidy¶ revived the old opinion of Horstius, that dysentery is contagious only through the dejecta, and that the virus must actually find its way to the mucous membrane of the alimentary canal before it can generate the disease. This opinion has been maintained by many subsequent authors, among the latest of whom I may particularly mention Heubner.** Even of those who are uncertain as to this point there are not a few who are inclined to agree with Bamberger,†† that it is practically safest to act as though the stools were contagious, and take every precaution against exposing the well to their effluvia. So, too, the opinion of Zimmermann, that dysentery, though not primarily contagious, may become so when great numbers of patients are crowded together, has found followers in modern times,‡‡ some of whom, however, insist that even in this case the poison is generated exclusively by the dysenteric stools. Only Savignac,§§ among prominent modern writers on dysentery, boldly ranges himself among the strict contagionists, and maintains that, independently of the dejecta, aerial effluvia from the sick may propagate the disease. Finally, in recent times some of those who adopt the view of Niemeyer, that dysentery is an infectious disease in the sense that it is generated by a miasm that can multiply without the body, are, like Barrallier,‖‖ inclined to make light of

* M. VAN GEUNS—*Die epidem. Ruhr*, German Transl., Dusseldorf, 1790, S. 91.

† MURSINNA—S. 14 u. 99, *op. cit.*, p. 646, *supra*.

‡ PINEL—T. II, p. 328, *op. cit.*, p. 605, *supra*.

§ HARTY—*Obs. on the Simple Dysentery and its Combinations*, London, 1805, Chap. 4, Sect. 2, p. 119.

‖ BROUSSAIS—Vol. III, p. 23, *op. cit.*, p. 643, *supra*—pointed out that when the air is rendered impure by vegetable ferments, such as proceed from marshes, intermittent fever is produced; when charged with decomposing animal corpuscles, continued fevers of malignant type, (mauvais caractère.) Perhaps the exhalations of filth, of privies and all kinds of excrements especially enjoy this property. But he held that the contagion even of the dysenteric excrements is slight, and that it is impossible for dysentery to show itself strongly contagious unless it is mingled with a malignant fever.

¶ FOURNIER et VAIDY—p. 347, *op. cit.*, p. 362, *supra*. They admit that the breath of dysenteric subjects is sometimes contagious, but affirm that this occurs only when the disease is complicated with typhus.

** HEUBNER—S. 510, *op. cit.*, p. 529, *supra*. Even NIEMEYER—Bd. II, S. 748, *op. cit.*, p. 645, *supra*—admits this mode of contagion. So, too, AITKEN—Vol. II, p. 657, *op. cit.*, p. 647, *supra*—remarks: "There is, therefore, good reason to believe that the exuviæ of dysenteric patients, as passed by stool, may, like those of typhoid fever, propagate the disease."

†† BAMBERGER—S. 389, *op. cit.*, p. 578, *supra*.

‡‡ Even ANNESLEY—Vol. II, p. 248, *op. cit.*, p. 621, *supra*—while he declares that he knew of no instance in which dysentery proved contagious in India, admits that it might possibly be so "under circumstances of crowding together of the sick, want of ventilation, and inattention to cleanliness and the removal of the evacuations." Prominent among those who adopted the view of ZIMMERMANN I may mention NAUMANN—Bd. IV, Abth. 2, S. 41, *op. cit.*, p. 645, *supra*—who held that the exhalations (Ausdünstungen) of the sick, though to a less degree than the dejecta, might act contagiously under favorable circumstances; and HAUFF—S. 342 *et seq.*, *op. cit.*, p. 534, *supra*—who has elaborated this view with great ingenuity. HEUBNER—*loc. cit.*, *supra*—takes very similar grounds, but refers the contagion wholly to the dejecta: "It would seem, then, that there is a limited contagion by means of the excreta of dysentery, which, however, only becomes active when a large mass of excreta is collected together." So, too, JACCOUD—*Traité de Path. Interne*, Paris, 1872, T. II, p. 330: "Si l'on entend par contagion, selon le sens rigoureusement étymologique, la transmission d'une maladie par contact direct, non, la dysentérie n'est pas contagieuse; mais si l'on veut avec moi, entendre par contagion, la transmission d'une maladie de l'homme malade à l'homme sain par un produit émané du malade, oui, certes, la dysentérie est contagieuse; et le contage, c'est-à-dire l'agent de la transmission, constitué vraisemblablement par des organismes inférieurs, est contenu surtout, sinon exclusivement, dans les matières alvines."

§§ SAVIGNAC—p. 51, *op. cit.*, p. 620, *supra*—mentions that a young lady, who visited a ward in a hospital under his direction in which there were several dysenteries, contracted the disease. He adds that if dysentery is contagious when it is endemic, it ought to be still more so when epidemic.

‖‖ BARRALLIER—p. 728, *op. cit.*, p. 603, *supra*. He simply remarks: "We ought not to pass in silence the deleterious action exercised by the emanations disengaged by the dysenteric dejections, especially on individuals obliged to stay in places where numerous cases of dysentery are collected," and adds that adequate ventilation will generally modify the injurious influence of this "local miasm."

the question of the contagion of the dejecta, or, even like Lubrez,* go so far as to deny that there is any evidence to prove that the dysenteric stools are more dangerous than healthy human fæces or any animal matters in a state of decomposition.

The very fact of the great diversity of opinion on this subject of contagion, which after so much controversy still exists, indicates that the evidence relied upon in support of the several views is far from being of a conclusive character. And in like manner the fact that the majority of the great observers, no matter what their opinion in other respects, agree in regarding the dejecta as contagious, would seem to indicate that the evidence as to this point is of a more satisfactory character than as to any other. For myself, I strongly incline to adopt the view of the contagion of the stools for at least a certain class of dysenteric cases, yet I frankly admit the recorded evidence on this head is by no means so conclusive as that which we possess with regard to typhoid fever. I sometimes think that the greater harmony of opinion as to this point among physicians before the time of Stoll grew out of the fact that typhoid fever cases were not sharply discriminated from those of dysentery;† and I do not doubt in the least that in such camp epidemics as those described by Chamseru and Gilbert, the association of dysentery with typhus explains the apparent intensity of the dysenteric contagion.

I have already discussed the slender evidence by which the opinion that drinking water contaminated by the dysenteric dejecta can propagate the disease is supported.‡ The opinion that it may be propagated by aerial effluvia from the dejecta has, likewise, a few apparently well observed facts in its favor. I admit that I cannot bring forward out of the experience of our civil war a single fact that can be regarded as positive in support of this view. The dreadful mortality from dysentery at certain points, as, for example, among the prisoners at Andersonville, seems to have been produced by the concurring influences of many factors, from among which it is impossible to isolate the share due to the dejecta. Belief in the contagion of dysentery, notwithstanding the extent to which the reasonable views of the accomplished Professor Alfred Stillé had been made public early in the war,§ was by no means common among our medical officers, and if any systematic effort was made to collect facts for or against any doctrine of contagion, it was not brought to my knowledge. In our great general hospitals dysenteric patients were treated for the most part side by side with the wounded and those suffering with other diseases, and it was a matter of common opinion among the medical officers with whom I have conversed, that the occurrence of dysenteric attacks among the physicians and hospital attendants was less and less frequent in proportion as the hospitals were more and more distant from the theatre of war; so that even these hospital cases were not usually attributed

* J. M. LUBREZ—p. 44, *op. cit.*, p. 618, *supra*: "Il reste maintenant à déterminer si les émanations des matières fécales dysentériques sont plus dangereuses que les matières fécales provenant d'hommes sains, que les matières animales en décomposition. Cette question est très-délicate; cependant rien ne semble le prouver." So, too, SEITZ—*loc. cit.*, note †, p. 651, *infra*—regards the supposition that the "germ of the infections" is to be found in the dysenteric stools as questionable.

† See p. 403 *et seq.*, *supra*. ‡ See p. 612 *et seq.*, *supra*.

§ ALFRED STILLÉ—*Dysentery*, Military Medical and Surgical Essays prepared for the U. S. Sanitary Commission, Philadelphia, 1864, p. 359: "The truth appears to be that its milder varieties are not contagious, but that its typhoid forms are highly so, and that its intermediate grades sometimes, however rarely, display this property. There is abundant evidence that the disease has been communicated by the dejections of the patients, by the privies or close-stools they have used, and by the clothes they have worn or soiled. Numerous instances prove that the introduction of a single case of dysentery into a hospital has been followed by a diffusion of the disease among the patients; that the arrival of such a patient in a healthy neighborhood has been followed by the attack of persons in direct communication with him; that persons employed in the wards of those sick with dysentery have, without being themselves affected, carried the disease to their families; and, finally, that the attendants upon dysenteric patients, even when they did not contract the disease, exhibited its malignant influence in numerous subcutaneous abscesses and an eruption of sero-purulent blebs, (rupia.)" If by "abundant evidence" Professor STILLÉ intended to indicate modern evidence, relating to dysentery from which actual complication with typhoid or typhus fever is carefully excluded, the hope may be expressed that at some time he will find it convenient to bring it forward, for certainly but little evidence of this kind has as yet been published.

to contagion. Nowhere have I heard of any local outbreak of dysentery among the civil population which was distinctly traceable to the arrival of any of the tens of thousands of dysenteric subjects who went home to recover or to die.

During the Franco-German war of 1870 the experience on this point was for the most part of a very similar character. According to Heubner,* in the reserve hospital No. 1, Leipsic, where out of six or seven hundred patients, two hundred or more had dysentery, no single case of undoubted contagion occurred. Seitz† reports that in the hospital at Munich there was not a single case among the attendants or patients in the hospital with the exception of those who had returned from the army in France, where they might be supposed to have contracted the disease. On the other hand, it is said that both physicians and nurses were attacked in the Metz hospitals,‡ and, according to Bayer,§ the same occurred in the hospitals at Bazeilles and Remilly, near Sedan. Heubner states, further, that several trustworthy army physicians informed him that in the field in France, when patients were crowded together, infection very often occurred by means of the privies, until stringent measures were taken to avoid it, after which it did not occur again. It will be observed that the stools appeared to be contagious only in places where the disease was prevailing; and we are assured by both Heubner and Brunner‖ that the dysenteric patients sent home to Germany during the war nowhere spread dysentery among the civil population, as would have happened in the case of a contagious disorder.

In the year 1875 an outbreak of dysentery occurred in a French regiment at the camp near Chalons, in which, according to Czernicki,¶ the disease was unmistakably spread by the latrines; he even goes so far as to assert positively that the minimum period of incubation was seven days. This observation recalls the account given by Clouston,** ten years before, of an outbreak of dysentery in the Cumberland and Westmoreland Asylum, which appeared to be caused by the offensive exhalations of a field irrigated with sewage, and ceased when arrangements were made to convey the sewage elsewhere: the period of incubation is said to have been from three to six days; but the facts in this case would seem to indicate that the exhalations of ordinary sewage, without any contamination with dysenteric excreta, are capable of generating dysentery, so that the narrative is, on the whole, unfavorable to the doctrine of a specific contagion.

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* HEUBNER—*loc. cit.*, p. 553, *supra*.

† F. SEITZ—*Aerztliche Beob. aus dem deutsch-französischen Kriege im Jahre* 1870–71 *besonders über die herrschende Ruhr*, Bayerisches Aerztliches Intelligenz-Blatt, No. 6, 1872, S. 73.

‡ HEUBNER—*loc. cit.* § J. BAYER: I cite from SEITZ—*loc. cit.* ‖ BRUNNER—*op. cit.*, p. 638, *supra*.

¶ CZERNICKI—*Relation d'une épidémie de dysenterie qui a sévi sur le* 8e *régiment de dragons, durant les manœuvres du camp de Chalons (Sept.* 1875), Rec. de Mém. de Méd. de Chir. et de Pharm. Militaires, T. XXXII, 1876, p. 125. The first cases occurred seven days after the regiment camped at two farms, (Vadenay and Piémont,) where they used latrines (fosses d'aisances) previously used by a regiment in which a number of cases of dysentery had occurred; the squadron lodged in the building nearest the latrines had most cases. The part of the regiment camped at Piémont arrived two days later than that which went to Vadenay, and the disease broke out among them two days later than in the other part. The regiment left the farms Sept. 9th and 10th, and the epidemic speedily ceased. The author concludes that direct contagion (in the sense of the transmission of the disease from the sick to the well without the intervention of any focus of infection) is not demonstrated, but that epidemic dysentery is certainly and energetically transmitted by latrines which have been used by individuals suffering under that disease; that the minimum period of incubation is seven days, and that the evacuation of the infected places arrested the epidemic.

** CLOUSTON—*op. cit.*, note † to p. 428, *supra*, at the end of the note. This outbreak began early in April, 1864, and ceased in August quite suddenly, on the change in the disposition of the sewage being made. The disease, therefore, ceased at the very time when dysentery is usually most prevalent. The irrigated field was about 300 yards from the female ward, where the greatest number of cases occurred, and 350 yards from the corresponding male ward. The several outbreaks which occurred during the season always followed, by a few days, periods when the wind blew from the field to the asylum: "From the first of the season, up till July, when the direction of the effluvia would be determined chiefly by the wind, males and females were attacked at different times, according as the wind blew towards the male or female side of the Asylum; in July and August, when, through the sultry calm nights, with a high barometrical pressure, the effluvia would spread in all directions along the ground, males and females were attacked promiscuously," p. 569. In March, 1865, there were five additional cases of dysentery, four of whom died; these cases occurred a few days after the sewage had for a single night been allowed to flow upon the same field when the wind was blowing towards the house. Moreover, "an obstructed drain was found near the ward in which the cases occurred, which had formed a little cesspool under the soil immediately below the windows of the ward." Now in this last outbreak it would appear that sewage not yet contaminated with dysenteric excreta produced the disease; and so with the earliest cases of the preceding year.

Additional special studies of local outbreaks of dysentery, undertaken with a view to the investigation of this question, are greatly to be desired. Especially should the nature of each particular endemic be considered in such investigations; for surely if the analogy of the throat holds good in matters of etiology, as it certainly does in pathological anatomy, it is only in the case of the diphtheritic form of dysentery that a contagion is to be anticipated. Yet this distinction, which must be regarded as essential to any fruitful investigation of the subject, seems to have been practically ignored in all the observations hitherto made.* No wonder that they have been unsatisfactory and conflicting in their tendency. No wonder that, although such suspicion attaches to the dejecta of the diphtheritic cases that prudence dictates the practice of all possible precautions with regard to their disposal, it cannot yet be said that their specific power of transmitting the disease is positively established as a fact.

In view of this uncertainty as to the very existence of a contagion, whether in the stools or otherwise, it would be wise to pause till further evidence is obtained, before indulging in speculations as to the ultimate nature of the contagion, if it should be proven that any exists. I have already sufficiently discussed the various hypotheses by which it is assumed that the contagion consists of low animal or vegetable organisms, and the speculation of Lionel Beale, who seeks it in minute particles of bioplasm.† A modification of this latter view has recently been advocated by Richardson,‡ under the title of the glandular origin of contagious diseases. According to him all contagia are modified secretions from glands: that of glanders, for instance, is generated by those of the nasal mucous membrane, that of hydrophobia by the salivary glands, that of typhoid fever by the glands of the intestinal mucous membrane. This view, if applied to the case of dysentery, would closely approximate that suggested by Horstius, which I confess appears to me quite as reasonable as any subsequent conjecture on the subject. Into any detailed discussion of such questions it would be unprofitable to enter in this place.

Nor is it possible in the present state of our knowledge to offer in all cases a satisfactory explanation as to why any one of the causes heretofore considered, or any combination of them, should in a given case produce dysentery rather than diarrhœa, or the reverse. On the one hand, it has been held by Virchow§ that external causes of all kinds, including even epidemic and endemic influences and contagion, give rise only to catarrhal inflammation of the intestinal mucous membrane, and that for this to pass into the diphtheritic process requires the coöperation of local influences, especially of fæcal accumulations. On the other hand, Niemeyer,‖ while agreeing with the first part of this proposition, insisted that the diphtheritic process requires for its development the action of a specific germ of infection which must be introduced into the organism from without.

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* Certain modern writers, as, for example, NIEMEYER—*loc. cit.*, p. 645, *supra*—after having carefully discriminated between catarrhal and diphtheritic dysentery, and assumed infection, with or without contagion, through the stools, for diphtheritic dysentery only, proceed to bring forward in support of this view the old observations, made not only without any recognition of the difference between these forms of dysentery, but without distinct recognition of the difference between dysentery and typhoid fever with bloody stools. Conclusions arrived at in this way are of little value.

† See p. 278 *et seq.* and p. 367 *et seq.*, *supra*.

‡ BENJ. W. RICHARDSON—*A theory as to the natural or glandular origin of the contagious diseases*, (being the address by the President to the Sanitary Congress, Leamington, Oct. 3, 1877,) Nature, Oct. 4, 1877, p. 489.

§ VIRCHOW—S. 356, *op. cit.*, p. 631, *supra*: "Im Allgemeinen würden wir also annehmen, dass der einfache Darmkatarrh sich bei Anwesenheit des entsprechenden Zersetzungsmaterials und an den Stellen, wo es sich findet, zur Diphtheritis steigert, und dass diess Zersetzungsmaterial am häufigsten durch retinirte Fäkalstoffe, die zuweilen vegetabilischer Art sind, geliefert werde. Der Katarrh kann bald aus epidemischen, bald aus endemischen, bald aus humoralen (dyskrasischen), bald aus localen Einwirkungen hervorgehen; die Retention der Fäkalstoffe kann durch Erschlaffung der Muskelhäute, durch anomale Lagerung der Därme, durch Fixation einzelner Stellen derselben etc. bedingt sein;" and again: "Mag man auch immerhin eine grössere Häufigkeit von Erkältungen, öfterm Genuss schwerer verdaulicher Substanzen oder Aehnliches, späterhin Contagion als Ursache der katarrhalischen Darmaffektion ansehen, so ist es doch wahrscheinlich, dass ohne das andere Moment die diphtheritische Steigerung nicht eingetreten sein würde," p. 357.

‖ NIEMEYER—*loc. cit.*, p. 645, *supra*.

I confess that I am not prepared to adopt either of these exclusive views. I have already attempted to show that Virchow's assumption of the invariable participation of fæcal accumulations in the development of diphtheritic dysentery is in many instances contradicted by observation; and surely, if we imagine the existence of a dysenteric infection or contagion similar to that which appears to exist in the case of throat diphtheria, analogy would favor the opinion that the dysenteric germs would be themselves capable of developing even the most malignant diphtheritic process without the cooperation of any other local irritant. The view of Niemeyer seems, therefore, much more logical; but is it in accordance with the facts? Is it not true that single sporadic cases of dysentery occasionally assume all the clinical characters of the diphtheritic form, terminate fatally, exhibit on dissection all the typical features of the diphtheritic process, and yet do not act as a focus of infection from which other cases are developed?

I willingly agree with Virchow that local influences, such as he has described, may induce a catarrhal inflammation of the intestinal mucous membrane to assume the diphtheritic form; but I incline to believe also that a sufficient degree of intensity or duration in the action of any of the other local irritants of the intestinal mucous membrane which have been discussed may do the same, especially if favoring constitutional conditions coexist. I also willingly agree with Niemeyer that epidemic or endemic influences, possibly also a contagion contained in the dejecta, are capable of producing diphtheritic dysentery in those predisposed by constitutional or local causes; but I am not prepared to admit that the action of such influences is a condition indispensable to the development of this form of dysentery, or that their presence must be assumed in every sporadic case that presents its symptoms during life, or even its anatomical characters after death.

Still less can I admit that in the case of armies in times of war the prevalence of diarrhœa and dysentery in the camps is of itself any necessary indication of the existence of a genuine epidemic or endemic influence over which human agencies could be hoped to exercise little or no control. Not recent investigations only, but the general tenor of all military medical history is thoroughly opposed to any such deplorable doctrine. On the contrary, a careful survey of the evidence seems fully to justify the belief that these diseases generally result from the simultaneous action upon large numbers of men of several of the predisposing and exciting causes which have been discussed; some of the most dangerous of which—contaminated drinking water, insufficient or faulty alimentation, camp filth of every kind, especially human excreta, and all the reckless exposures and fatigues which are not required by the actual necessities of the campaign—it is quite possible, even in the present state of our knowledge, for an intelligent Medical Staff to point out and a wise Army Administration to avoid.

These preventable causes determine, I fully believe, of themselves alone, a great proportion of the diarrhœas and dysenteries of camps; when other less understood, and therefore less avoidable, causes come into play the preventable causes still vastly increase the number of cases and the resulting mortality. The subject of the etiology of the fluxes still presents many obscure questions for future investigation, but the requirements of national economy and the natural desire for success in war, as well as the instincts of humanity, alike demand that the soldier in the field should enjoy to the fullest extent the benefit of the knowledge we already possess.

## 6. Treatment of Diarrhœa and Dysentery.

A systematic and complete analysis of the various methods proposed for the treatment of the several forms of diarrhœa and dysentery is quite out of the question here, both on account of the time required to prepare it and the space it would occupy; I have therefore determined only to attempt a sketch of those which have been most generally esteemed useful. In this I shall not try to present under separate headings an account of the plan of treatment adapted to each variety of flux, which would involve needless repetitions, but will endeavor, in connection with each of the several measures discussed, to indicate the limits of its usefulness.

Prophylaxis.—In the first place a few words must be said with regard to means of prevention, especially in the case of armies in times of war. These are to be sought in those wise administrative precautions which are also best adapted to preserve the troops from other destructive diseases. Officers skilled in medical topography should be consulted before selecting camp sites; the camps should not be overcrowded, and should be kept as cleanly as possible; strict rules should be adopted with regard to the position and management of the sinks and the disposition of offal; the best available water supply should be selected for drinking purposes, and the utmost vigilance exercised in preventing its contamination with fæcal matters or other filth; the supply of food should be liberal and judiciously selected; reasonably good arrangements should be made to secure proper cooking; suitable clothing should be supplied, and shelter provided whenever military necessity does not absolutely forbid. I suppose there is no military surgeon of experience now living who does not believe that an intelligent application of these simple rules, to an extent quite within the limits of possibility, would vastly diminish both the number of cases and the mortality of the fluxes and fevers of armies in times of war.

No doubt sins of omission in any of the directions indicated have a share in determining the prevalence and fatality of both groups of disease, but those connected with the food supply have unquestionably a preponderating influence in connection with the occurrence of the fluxes. So soon as from insufficient quantity, quality or variety of the food that general constitutional condition is developed which may be conveniently designated a *scorbutic taint*, the number and fatality of the cases of these disorders begin to assume colossal proportions. When the subject of scurvy comes to be discussed, the question of a proper ration for the soldier, and especially how far it is essential and possible for fresh vegetables to be supplied to troops in time of war, will be considered. At present it must suffice merely to indicate this as one of the most important questions connected with the prevention of the fluxes.

A knowledge of the precautionary rules just mentioned will serve to indicate the measures that should be taken when, after the neglect of these precautions, fluxes begin to prevail. The neglect does not always proceed from ignorance; it is often, to some extent at least, the inevitable result of the sad necessities of war; but in either case the methods which should be adopted are quite the same, and if in the emergency it is impossible to resort to them, no amelioration of the pestilence that may have arisen can reasonably be expected. It must, of course, be admitted that even the most conscientious adoption of hygienic regulations cannot in the present state of our knowledge be hoped to afford com-

plete protection against the occurrence of the fluxes. It has been shown that the facts of the distribution of these diseases, especially in civil populations, clearly indicate the existence at certain times and places of an unknown etiological factor; and against an unknown cause no trustworthy defensive measures can be contrived. But even in civil populations it is clear that the neglect of known hygienic precautions has much to do with the endemic and epidemic prevalence of the fluxes, and certainly, both in civil populations and armies, such negligence has a great share in determining both the number of cases and the mortality on any particular occasion.

The strictest application of the hygienic rules indicated is, therefore, demanded so soon as diarrhœa or dysentery appears in epidemic form, whether in armies or among the people. A systematic application of disinfectants, not only to the apartments occupied by the sick, to their dejecta and clothing, but to the dwellings and surroundings of the well, is also indicated. In the case of camps, after the enforcement of rigid police, the tents or huts, the latrines used by the well, and all gutters or drains should be thoroughly disinfected. In villages and towns the same process should be applied to the privies, alleys, sewers and the squalid abodes of the poor. A belief in the contagious character of the disease long ago suggested the precaution of separating the sick from the well,* and whatever opinion may be adopted in connection with the question of contagion, there can be no doubt that in the case of military hospitals it is advisable to treat patients laboring under diarrhœa and dysentery in separate wards rather than to mix them indiscriminately with those suffering from other diseases or, still worse, with the wounded, whose condition cannot fail to be imperilled by such a course.

Whether, in addition to these hygienic precautions, it is practicable for individuals to secure immunity during the epidemic or endemic prevalence of these diseases by any special regimen or mode of life is by no means established with certainty. The use of aromatic fumigations in the homes of the well, supposed to destroy the *semina morborum* in the air, has long since lost credit and been replaced by the more intelligent modern use of disinfectants.† So, too, the employment by the well of various aromatic and mild astringent medicaments, under the idea that they strengthen the bowels and render them less liable to the inroads of disease, has deservedly passed out of use.‡ Great stress was formerly laid on the use of a suitable diet as a means of prevention; only the most digestible articles should be employed; unripe fruits should be especially avoided; excesses at the table, and especially excess in the use of wine and ardent spirits, should be shunned.§ There is a certain amount of truth in the representations which have been made on this subject, but it is exceedingly doubtful whether any precautions of this kind, beyond those which should be taken at all times by whoever desires to enjoy good health, are of the slightest importance; and whatever may be said of the use of unripe fruit, the ripe fruits of the season should not be interdicted.

Some of the older writers attached much importance to keeping the bowels open during the epidemic prevalence of dysentery by the occasional administration of laxatives and

* Compare, for example, the remarks of DEGNER—Cap. IV, § 15, S. 253, *op. cit.*, p. 625, *supra*.

† FAB. HILDANUS—Cap. 21, p. 697, *op. cit.*, p. 641, *supra*—has given a detailed account of the formulæ of this kind which were relied upon at the commencement of the seventeenth century.

‡ See, particularly, the discussion of this subject by FAB. HILDANUS—p. 698, *op. cit.*, last note—who enumerates among the substances which may be used Bezoar stone, burnt hartshorn, terra sigillata, juniper berries, absinthium, tormentil, bistort and other vegetable astringents; nutmeg, mace, cloves and other aromatics; and gives several elaborate formulæ composed of these and similar ingredients, to which he attributes special power as corroborants of the stomach and intestines, which thus assisted are better able to resist the influence of the morbid cause.

§ Compare, on this subject, also p. 697, *op. cit.*, last note.

clysters; and more recent observations by Virchow are favorable to this view.* Certainly it is more than ever desirable under such circumstances to relieve constipation by suitable medicines. So, too, prompt medical treatment should be at once resorted to for any cases of slight diarrhœa that may occur; and it is more than usually important that evacuating measures should be relied on for this purpose, rather than the diarrhœa mixtures consisting of opiates, astringents, stimulants and aromatics, which are so often recklessly employed under these circumstances.

General management of the sick.—In all cases of acute diarrhœa, and still more so in acute dysentery, it is desirable, particularly in the case of soldiers, that the patient be at once put to bed.† In the more severe cases this is imperatively required, no matter what the occupation of the sufferer; but in the case of soldiers it is important, from the military point of view, to shorten as much as possible the time each man is excused from duty, and absolute rest greatly favors this result. Exercise aggravates the intestinal disorder in proportion to its activity, while quiet and repose are favorable to the restorative operations of nature. In the more aggravated diphtheritic cases the patient should not even be allowed to rise to evacuate his bowels or to urinate, but should be furnished with a bedpan. During convalescence from the acute fluxes, however, and during the slow progress of chronic cases, a certain amount of passive exercise or even of walking in the open air becomes sooner or later desirable.‡

* Thus Fab. Hildanus—*loc. cit.*, note ‡, last page—remarks: "Toto contagionis tempore alvus lubrica esse debet." He prescribes the use of clysters, suppositories and laxatives for this purpose, and adds: "Per intervalla quoque corpus purgandum est," for which purpose he specially recommends rhubarb. Now, Virchow—S. 357, *op. cit.*, p. 631, *supra*—has recorded that during the prevalence on several occasions of epidemic contagious dysentery in the Charité hospital at Berlin, the disease always chiefly spared the syphilitic wards in which at that time the patients were treated, without mercury, by a plan in which laxative medication was prominent. This observation would seem to show that the old practice was not without merit, and, indeed, of all medical prophylactic plans it appears the most reasonable.

† No one has more intelligently presented the importance of these measures than Fab. Hildanus—Cap. VII, p. 675, *op. cit.*, p. 644, *supra*—who has also given a rude wood-cut representing a form of bedpan suitable for such cases which is still in general use. Long before, Celsus—Lib. IV, Cap. 15, Lee's Ed., Vol. I, London, 1831, p. 296—had said, in connection with the management of dysentery: "In the first place rest must be enjoined, for every species of agitation ulcerates;" and still earlier Hippocrates directed motion to promote and rest to moderate the evacuant action of hellebore, showing that he fully appreciated the influence of these conditions upon the functions of the alimentary canal; see *Aph.* IV, 15, [Ed. Littré, IV, p. 507;] also the commentary of Galen on this passage, [Ed. Kühn, XVII, B, 675.]

‡ Whether the exercise of a special function is also beneficial to dysenterics is a question concerning which there is a curious literature. In the Hippocratic treatise *De Morbis Vulgaribus*, Lib. VII, § 122, [Ed. Littré, V, p. 468,] the following passage occurs: Πορνείη ἄχρωμος δυσεντερίης ἄκος. which Foes—Frankfort Ed., 1595, Sect. VII, p. 339—translates: "Impudens scortatio difficultati intestinorum medetur," and Littré—*loc. cit.*—"Le coït, remède de la dysenterie." A number of critics have protested that this could not have been the meaning of Hippocrates. Thus Calvus, who made the first Latin translation of Hippocrates, (published 1526,) from a manuscript in the Vatican, substituted Πορνή, *i. e.*, meretrix, for the first word, and supposed ἄχρωμος to be the name of a woman who had a remedy for dysentery. I have not been able to see this version, which, according to Le Clerc—*Hist. de la Méd.*, La Haye, 1729, p. 241; I cite from Goulin, p. 10, *op. cit.*, *infra*—reads, "Meretrix Achromos dysenteriæ medela." Goulin—*loc. cit.*—has however, pointed out that neither this version nor the Greek, as rendered above, bears the meaning attributed to it by Le Clerc, but would properly signify "La courtisanne nommée Achromos est le remede, ou un remede contre la dysenterie." He points out, however, that Le Clerc has misquoted Calvus, who rearranged this sentence with the two preceding ones, making from them but a single one, which terminates thus: "Quam potionem meretricula, Achromos nomine, dysentericis remedium dedit." But the belief represented by the subsequent Latin versions was one well grounded in ancient medicine. Thus Ætius, citing from Rufus the Ephesian—Tetrab. I, Serm. III, Cap. 8, Lyons Ed., 1549, p. 142—explains hat the exercise of this function should be shunned during acute fluxes, but that "inveterata aliquando per venerem resiccantur," and Paulus Ægineta—Lib. I, Cap. 35, Vol. I, p. 45, Ed. cited p. 624, *supra*—expressed the same opinion. Accordingly Foes—*op. cit.*, Sect. VII, p. 341—exclaims: "Adeo ridiculum est quod de Achromo meretrice hic somniat Calvus." Another attempt to escape the significance of this passage was made by Dacier—*Les Œuvres d' Hippocrate traduites en François*, Paris, 1697, T. II, p. 371; I cite from Goulin, p. 7, *op. cit.*, *infra*—who, by modifying the text, makes the passage read, "La fornication est un méchant et un détestable remede à la dysenterie," but this reading has found few adherents. Somewhat better received has been the ingenious transposition of Triller—*De vitandis sordidis ac lascivis remediis antidysentericis præsertim vero de fœda scortatione*, &c., Opuse. Med., T. III, Frankfort, 1772, p. 40 *et seq.*—who, after a most elaborate and curious commentary, to which I refer the learned reader as very entertaining, proposes a rearrangement of the words of the passage in question and those of the preceding sentence, so as to wring out of them the following interpretation: "Qui ex spinali medulla tabescebat, a nimia scortandi libidine, decolor et enervatus, septima die mortuus est: prodeuntibus prius excrementis, liquidis, crudis et indigestis. Salsa cum melle, sunt dysenteriæ medela," p. 83. Nevertheless the majority of commentators favor a more literal reading. Amatus Lusitanus—*Cur. Med.*, Venice, 1557, Cent. II, Cur. 47, p. 289—declared that he himself had known cases of epidemic dysentery to be cured by this hygienic measure, and relates one in illustration. In the scholia to this observation he seems to think the meaning of Hippocrates even more gross than the ordinary interpretation makes it, remarking: "Est autem scortatio, sive ut ille ait, turpis scortatio, ea qua Diogenes Cynicus, quum meretricem expectaret usus fuit. Cui quum ad illum expectantem, sed tarde pervenisset, turpiter, et contra Dei præcepta objecit, manus Hymenæum celebrando te prævenit. Ejecerat autem in terram semen pudendis manu admota." A more temperate, and, as I think, a sounder commentary than any of these, has been offered by Ackermann,-(1777)—p. 150, *op. cit.*, p. 620, *supra*—who points out that, according to the common opinion of the ancients, the secretion in question is formed from the most subtle portions of the four humors believed to compose the body, and especially from the phlegm; in support of which he cites the Hippocratic treatise, *De Genitura*, [Ed. Littré, VII, pp. 471-475.] Hence the ancients thought the exercise of this function, by diminishing any superabundance of phlegm in the system, produced a favorable effect in those diseases which, like certain forms of dysentery, were, in their opinion,

In arranging accommodations for patients laboring under the fluxes great care should be taken to avoid overcrowding, and all the influences that are embraced under the generic term hospitalism. Special precautions are desirable in cases of dysentery and the chronic fluxes. It is an old experience that the sick do better in tents* than in buildings, and in suitably constructed barrack-hospitals than in hospitals improvised in churches, public buildings or private dwellings. Nevertheless all the unfavorable conditions of hospitalism may be developed in overcrowded ill-ventilated tents placed too closely together, allowed to remain too long on the same spot or to become filthy. The utmost cleanliness, good ventilation† and the avoidance of overcrowding are therefore indispensable conditions in all cases. Cleanliness should extend not merely to the condition of the wards or tents, but especially to the bedding, clothing and persons of the sick. When bedpans are used in the ward some disinfectant fluid, as, for example, solution of sulphate of iron mixed with impure carbolic acid, should be introduced into the vessel before it is used, and afterwards it should be immediately removed from the apartment, and the sinks or water closets into which the discharges are thrown should be frequently disinfected. After each motion the anal region should be carefully washed with warm water and soap, and, if found necessary, the skin should be protected by anointing it with a suitable ointment. In case of involuntary evacuations, soiled clothing or bedding should be promptly removed from the ward, and saturated with some disinfectant before attempting to wash it. The washing of such articles should be conducted separately. In view of the frequency of pneumonia as a complication in both acute and chronic cases, it is important that the patients should not be exposed to unnecessary draughts; and in winter the apartment should be kept duly warmed, (65° to 70°, Fah.)

In case of tardy convalescence from dysentery and in the chronic fluxes, a change of climate often becomes desirable, and is not unfrequently the only means by which life can be saved. The English and French colonial experience has amply demonstrated the beneficial effects of the return of such invalids to their native soil;‡ and in the fluxes of armies, it has long been well known that escape from the alimentation and atmosphere of the camps and military hospitals and return to the diet and surroundings of home are often

caused by a flux of phlegm. He points out that this doctrine is clearly taught by HIPPOCRATES—*De Morb. Vulg.*, Lib. VI Sec. 5, [Ed. Littré, V, p. 321,]—in a passage which FOES translates, "Veneris usus morbis a pituita confert," *op. cit., supra*, Sect. VII, p. 270, and LITTRÉ, *loc. cit.*, "Le coit est avantageux dans les maladies provenant du phlegme." The commentary of GALEN—Ed. Kühn, T. XVII, B, p. 284—on this passage fully sustains these interpretations, though he explains that the measure in question is only useful to such patients as are not already too much debilitated. A view similar to that of ACKERMANN was taken by GOULIN—*Explication d'un passage des Épidémies d'Hippocrate*, Paris, 1783—who, besides the quotation from Epidem. VI, recalls one of the *Problems* of ARISTOTLE, Sect. I, § 59, Opera Gr. Lat., T. IV, Didot's Ed., Paris, 1857, p. 117: "Cur morbis qui contrahuntur a pituita, res venerea prodest? An quod semen genitale excrementi cujusdam detractio est, naturamque pituitæ, ita ut quominus multum pituitosæ detrahit materiei, juvet concubitus?" which shows that the great naturalist entertained a similar opinion. GOULIN, however, substituted the words δὲ χρονίου for ἀχρώμους, and translates the passage "Coitus diuturnus dysenteriæ medela." LITTRÉ—*loc. cit.*—as seen by his version, adopts the general opinion. ACKERMANN—*loc. cit.*—has, however, prudently remarked that, even if the remedy be a good one, it is not always possible to employ it in serious cases: "Sæpius enim evenit, ut in tanta nervorum totius corporis debilitate animus quoque languescat, suavissimasque concubitus illecebras vix persentiat; nervusque * * * quamvis tota palpetur nocte, quiescat iuersque jaceat, immo torpeat, nullaque omnium petendi neque cupiditate, flagret, neque vi polleat," *op. cit.*, p. 153.

* MURSINNA—Cap. 5, p. 99, *op. cit.*, p. 646, *supra*—emphasized this circumstance on the occasion of dysentery of the camp near Nimes. He found the cases treated in camp, in spite of the persistent rain, were manifestly more manageable and got well sooner than those treated in the neighboring village, only a few thousand paces distant, where two houses had been fitted up for hospital purposes.

† These points were already dwelt on at length by FAB. HILDANUS—*loc. cit.*, note †, p. 655, *supra*.

‡ The general practice of the English physicians in India may be summed up in the language of Prof. W. C. MACLEAN—Art. *Dysentery*, Reynolds' Syst. of Med., Vol. I, London, 1866, p. 123: "*Chronic Dysentery.*—Whenever the disease falls into this stage and resists treatment, the patient should as soon as possible be sent to a better climate. If the locality be malarious, this should be done at once. Often moving him to the seaside suffices. More frequently a voyage to Europe is essential to recovery; many lives are lost by delaying this measure until it is too late." According to MOREHEAD—*Clinical Researches on Disease in India*, 2d Ed., London, 1860, p. 312 *et seq.*—the overland journey from India is exceedingly trying unless the patient is in a state of advanced convalescence, and the sea-passage should be preferred. The English soldier who has contracted a chronic flux in India, or other tropical colonies, is sent home to be treated at Netley; the French from Cochin-China, &c., to the naval hospitals at Brest, Toulon and Cherbourg. The French troops in Algeria equally experience the necessity of evacuating their chronic fluxes upon France. HASPEL—T. II, p. 117, *op. cit.*, p. 621, *supra*—strongly insists upon this point, and also upon the necessity of not postponing the transfer until the patients are too exhausted to support the fatigues of the journey.

followed by prompt restoration to health.* This result was strikingly illustrated by the experience of our civil war, as must always be the case when an invading army campaigns in a more southern region than its native land. It was constantly observed that the transfer of those sick with fluxes to the more northern hospitals proved beneficial to great numbers of them. Still more beneficial appeared to be the result of a long furlough, or discharge from service on surgeon's certificate of disability. Undoubtedly under such circumstances the change of climate counts for much, especially when the transfer is made from a warmer to a cooler, from a malarial to a non-malarial, from a low to an elevated region; but even the most favorable change of this kind cannot be expected to produce its full benefit unless the patient in his new locality is surrounded with favorable hygienic conditions and supplied with proper food. It will be understood without argument that it is only when the destruction of the mucous membrane by ulceration or sloughing is not too extensive that such a change can effect a cure; but it would be unsafe to assume from the abundance of pus, or from any other characters of the stools, or from almost any degree of debility or exhaustion of the vital powers, that this condition exists in any particular case, and experience shows that apparently desperate cases occasionally recover.

The prompt removal of convalescents from dysentery and patients laboring under chronic fluxes from the camps of an invading army, and from the neighboring base hospitals, is therefore a measure of the utmost importance. It is demanded not merely by humanity to the sick, but by economy and the best interests of the fighting force. Liberally supplied hospitals should be established at convenient healthy points for the treatment of such cases; soldiers who have comfortable homes should be freely furloughed, and none should be ordered back to duty until their health is fully reëstablished; the wholesale discharge from service of such cases on surgeon's certificate of disability, which was so commonly practiced during our civil war, would thus be rendered unnecessary. Such a policy as has been sketched will produce better results, in the maintenance of a serviceable army in the field, than can flow from vain attempts to keep the sick with or near the army, where they must embarrass its movements and increase its mortality.

Diet.—Suitable alimentation for patients laboring under the fluxes is of equal, perhaps even of greater, importance than wise medication. This subject was treated by the ancients with a minuteness which has not been excelled in modern times, and their conclusions, based upon observation, are in many particulars supported by the experience of the best instructed recent investigators.

The drink.—In the first place the greatest care should be taken to secure good *drinking water*, and where the ordinary supply is of doubtful character, especially if there is reason to suspect sewage contamination, special arrangements should be made for the sick. Rain water, if collected with reasonable precautions, may be advantageously employed, as was long ago recommended for patients suffering under dysentery by Ætius, Alexander of Tralles and Paulus Ægineta.† Probably distilled water would be still safer, but it is not

* No one has more pertinently insisted upon this point than Donald Monro—*Obs. on the Means of preserving the Health of Soldiers, &c.*, Part II, Sect. 10, 2d Ed., London, 1780, Vol. I, p. 129 *et seq.*

† Ætius—Tetrab. III, Serm. 1, Cap. 45, Lyons Ed., 1549, p. 605—recommends the use of rain water in dysentery from the beginning of the case, but cautions against employing that collected from roofs covered with lead, which he says will give dysentery even to well men. If rain water cannot be obtained, that of springs will do, but well water should always be avoided, especially if it is subsaline, as it perturbs the bowels. Rain water is also recommended by Alexander of Tralles—Lib. VIII, Cap. 8, p. 432, Ed. cited p. 624, *supra*—in rheumatic dysentery; and by Paulus Ægineta—Lib. III, Cap. 42, Vol. I. p. 527, *op. cit.*, p. 624, *supra*. Celsus—Vol. I, p. 297, *op. cit.*, p. 656, *supra*—had long before recommended the use of pure water in dysentery, to be taken warm if there was fever, while later in the case he advised very cold water, which he regarded as an astringent. On the other hand, Paulus—*loc. cit.*—recommends cold water, especially if "the intemperament is very hot."

always possible to obtain it. Next to this, that which has been boiled* may be recommended, and, if there is suspicion of organic impurities, this operation may be preceded by the use of permanganate of potash, or other well known oxidizing agents. If we may rely upon the recent experience of Champouillon,† the mere admixture of a small proportion of claret might be expected to effect the same result by rendering any organic impurities which may be present insoluble.

Various opinions have been expressed as to the quantity and temperature of the drinking water allowed in cases of acute dysentery. Celsus‡ taught that if there be fever the water should be warm, and that if the disease persists, very cold water should be given, because it astringes the ulcers and so commences a cure; but the latter opinion has long since been abandoned. Sennertus§ held that all drinks should be very sparingly administered. On the other hand, during the last century several physicians advised the use of water in large quantities, under the idea that it diluted and washed away the acrid contents of the intestinal canal. Thus Degner declared moderately cold water used freely to be one of the most potent remedies for dysentery. Huxham advised it to be drunk quite cold in large quantities. Tissot and Zimmermann‖ equally lauded the free use of water, but advised it to be drunk warm; indeed the latter declared that cold drinks are always noxious at the beginning of the disorder, his opinion in this respect has been repeated by some of the most accomplished modern writers on dysentery, such as Naumann and Bamberger; while Heubner¶ explains that cold drinks always bring on painful contractions in the transverse colon. This is undoubtedly true in some cases, and then, of course, cold drinks must be avoided; but it is far from being a general rule. Indeed, when there is no irritability of the stomach, ice water in small quantities, frequently repeated, is often quite as innocent as it is agreeable to the patient. When the stomach is irritable, ice-cold carbonic-acid water cautiously administered is often of service in allaying the gastric disorder;** and morsels of cracked ice allowed to melt in the mouth afford a great comfort to the patient, even when drinks of all kinds are rejected. The best rule as to the temperature of the drinks is to select that which is most agreeable to the patient, and as to quantity, to administer small portions frequently rather than to permit large draughts to be swallowed at a time. The notion that the disease could be, so to speak, washed away by the mere quantity of fluid swallowed has been deservedly abandoned.

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* WHITWELL—*loc. cit.*, p. 603, *supra*—has recommended that the water supplied to dysenteric patients should be boiled, to get rid of the mica scales he supposes to do so much mischief, and DOUNON—*Suppression de la dyssenterie par l'ébullition de l'eau*, L'Abeille Médicale, An XXXV, 1878, p. 61—to kill the anguillula stercoralis and other parasites supposed to cause Cochin-China dysentery; see note ‡, p. 372, *supra*. I approve heartily of the measure without accepting these reasons for it.

† *Loc. cit.*, p. 613, *supra*.

‡ CELSUS—Lib. IV, Cap. 15, Vol. I, p. 297, Ed. cited p. 656, *supra*. AMATUS LUSITANUS—Cent. 2, Cur. 45, p. 289, Ed. cited p. 656, *supra*—has related a case of bilious dysentery in which ramenta had already made their appearance in the stools, but which was cured by copious draughts of cold water without any other treatment.

§ SENNERTUS—T. III, p. 184, Ed. cited p. 645, *supra*: "Parce bibere præcipuum auxilium est."

‖ DEGNER—Cap. III, § 77, p. 191, *op. cit.*, p. 625, *supra*: "Nullum est in natura remedium, quod, si pertinus sit in agendo, non etiam noceat, si perverse adhibeatur." He advises that the water should be boiled, and states that he himself, while suffering from a "diarrhœa fili se-fœtida," drank, with advantage, 24 pints (libras) of tepid water in a single day; two days later, 48 pints within 14 hours, and again, still later, between 24 and 30 pints in 2 hours. No wonder ZIMMERMANN—*loc. cit.*, *infra*—exclaimed "a heroic stomach is required to support a deluge of this kind." According to HUXHAM—*De aëre et morb. epidem.*, 1743, in Opera Phys.-Med., Lipsiæ, 1774, p. 392—there is no disease in which diluent and demulcent drinks are more demanded than in dysentery, and he declares that he has cured cases with no other remedy than this (with a little opium added however) after the patient had been suitably purged. TISSOT—T. III, p. 10, *op. cit.*, p. 625, *supra*—asserted that he had cured many dysenteries by administering a cup of tepid water every quarter of an hour without any other remedy. ZIMMERMANN—Cap. IV, S. 71, *op. cit.*, p. 348, *supra*—repeats this statement upon the basis of his own experience, and affirms that water copiously drunk is a universal remedy in dysentery as well as in fevers.

¶ M. E. A. NAUMANN—Bd. IV, Abth. 2, S. 77, *op. cit.*, p. 645, *supra*; BAMBERGER—S. 461, *op. cit.*, p. 578, *supra*; HEUBNER—S. 542, *op. cit.*, note *, p. 529, *supra*.

** FOURNIER et VAIDY—p. 390, *op. cit.*, p. 352, *supra*—recommended "de l'eau gazeuse de Seltz ou de Spa, avec un peu de vin," during convalescence from dysentery; without the wine, these or any natural carbonic-acid waters devoid of active medicinal properties, or the artificial carbonic-acid water, may be drunk at any stage of the disease; the natural purgative waters also prove serviceable in cases in which such remedies are indicated.

With regard to the use of *coffee* and *tea*, it may be said that there is no reason to believe them injurious, provided they are acceptable to the patient. Even in the early stages of acute dysentery, when astringent medication is most to be deprecated, it is improbable that they do any harm unless given too strong or in excessive quantities. Indeed, according to Roché, coffee, with sugar but without milk, taken frequently in moderate quantities, is a valuable remedy for dysentery; and more recently Savignac, without adopting this view, has expressed himself favorably with regard to the use of black coffee in that disease.* Strong tea, as it is still more advantageous than coffee when astringent remedies are desirable, is still more objectionable when they are contraindicated; yet if reasonably diluted it may be used with impunity in most cases. Naumann testified that he cured himself of a mild attack of dysentery with black tea, taken with a little sugar and milk; and Savignac preferred an infusion of tea to any other habitual drink for dysenterics.†

As for *Alcoholic beverages*, there can be no doubt that some of the fermented drinks, such as beer, ale, cider and the like, should as a rule be avoided.‡ Although, as has already been shown, there are no valid reasons for charging these drinks with causing the fluxes, yet they so generally disturb the bowels when already diseased that they ought to be proscribed in all acute cases, and in chronic cases, except when they are earnestly desired by patients accustomed to their use and are found on trial not to disagree. Well selected wines, on the other hand, and even distilled liquors, have a considerable range of utility, particularly in acute dysentery and in the chronic fluxes. The Greek physicians attached considerable importance to the use of wine in dysentery, especially after the strength of the patient began to fail. They gave the preference to the red wines, or in a general way to astringent and austere wines, and used them at first much diluted with water or other liquids, afterwards, if necessary, pure.§ With comparatively few exceptions this practice was followed by the best instructed practitioners until the middle of the last century,‖

* J. U. E. von Reider—*Untersuch. über die epidem. Sumpffieber*, Leipsic, 1829, S. 181—advised the use of strong coffee, without sugar or milk, in obstinate dysentery. Hargens—*Ueber die epidem. Constitution zu Kiel*, &c., 1798, Hufeland's Jour., Bd. VII, St. 3, 1799, S. 154—used, under certain circumstances, strong coffee without milk; (nothing is said of sugar.) The observations of Roché, referred to in the text, were communicated in a letter dated June 12, 1822, to Fodéré—*Leçons sur les Épidémies*, &c., T. II, Paris, 1823, p. 102—who seems to have been prudently skeptical as to the active virtues attributed to this drink. Savignac—p. 471, *op. cit.*, p. 620, *supra*—remarks: "Le café, qui a un mode d'action physiologique, et à l'occasion, thérapeutique, très-analogue à celle du thé, me paraît généralement utile. Mais je repousse le café au lait, qui peut favoriser la diarrhée, et je préfère le café noir."

† Naumann—S. 77, *op. cit.*, p. 645, *supra*. Savignac—*loc. cit.*, last note—states that the drink he habitually prescribes to dysenteries is an infusion of tea which he sweetens with syrup of quinces and administers warm.

‡ Already Fabricius Hildanus—p. 679, *op. cit.*, p. 644, *supra*—counseled against the use of beer in dysentery, and Hoffmann—T. III, p. 156, *op. cit.*, p. 647, *supra*—was of the same opinion. Sennertus—T. III, p. 184, *op. cit.*, p. 645, *supra*—on the other hand, permitted the use of good beer; Sydenham—Vol. I, p. 180, transl. cited note †, p. 407, *supra*—gave his patients beer slightly warmed, even during the first days of the disease, and Geach—*Some Obs. on the present epidemic Dysentery*, London, 1781, p. 36—declares that during the Plymouth epidemic he permitted his patients to drink either beer or cider, and saw no ill consequences result. Most modern physicians will, I suppose, agree with the view expressed in the text, though it is probable, as Savignac—pp. 464–5, *op. cit.*, p. 620, *supra*—admits, that those who are accustomed to the free and habitual use of these beverages may use them with impunity. I need not add that this writer objects as a general rule to the use of beer, and especially of cider: see his views in the note just cited. Heubner—S. 547, *op. cit.*, note ⁴, p. 529, *supra*—mentions "warm beer" among the stimulants that may be given in the exhaustion of diphtheritic cases. I can hardly assent to this practice.

§ In the Hippocratic treatise, *De Morb. Vulg.*, Lib. VII, § 3, [Ed. Littré, V, p. 369 *et seq.*,] will be found an account of a case in which red wine was used after the first few days of the disease. Aetius—*loc. cit.*, p. 658, *supra*—recommends wine only after the strength begins to fail; it should be astringent, but not very old. Alexander of Tralles—Lib. VIII, Cap. 8, p. 433, Ed. cited p. 624, *supra*—permitted the use of astringent wine in rheumatic dysentery; in dysentery with ulceration of the intestines—Cap. 9—he recommended wine mixed with water so soon as the strength of the patient begins to fail, p. 459; but if there be reason to think the disease proceeds from phlegm, the pure wines should be given: "Et vinum exhibendum Sareptinum, aut Tyrium, aut ex his quæ in Campania nascuntur, Britianum aut Palmatianum," p. 460. Paulus Ægineta—Vol. I, p. 527, transl. cited on p. 624, *supra*—says: "When the stomach is languid, wine may be taken." Celsus—p. 297, Ed. cited, p. 656, *supra*—speaks of the use of "light, austere wine" only as a substitute for astringent drinks.

‖ Thus Sennertus—T. III, p. 184, *op. cit.*, p. 645, *supra*—recommends the use of red, astringent wine mixed with pure water, or water in which red-hot iron or gold has been extinguished, so soon as the strength of the patient begins to fail, and remarks that if the digestive powers are debilitated the use of wine is always advantageous, sometimes even necessary. Fab. Hildanus—Cap. 7, p. 679, *op. cit.*, p. 644, *supra*—permitted the use of red, astringent wine under the same circumstances, though he counsels against the use of wine so long as there is fever or inflammatory symptoms. Even Sydenham—*loc. cit.*, note ‡, *supra*—if the strength of the patient was "much pulled down," advised "half a pint of Canary wine, boiled along with a quart of water, and cooled," to be used as an "ordinary drink." Hoffmann—*loc. cit.*, note ‡, *supra*—advised "sub finem morbi, ad intestina roboranda, haustus vini generosi;" and Degner—p. 195 *et seq.*, Ed. cited p. 625, *supra*—advised throughout the disease, even if fever be present, the use of the subacid wines of the Rhine and the Moselle; but he thought generous and sweet wines, such as those of Spain, were not well borne, and objected to the red, astringent wines of France, especially in the beginning of the disease.

when the energetic protests of Zimmermann led a considerable number of physicians to regard with distrust the use of alcoholic beverages in this disease, and either to administer them with great caution or to abandon them altogether.* This view was adopted subsequently by Broussais and his school† as a part of the rigid antiphlogistic treatment which they employed in dysentery; but a certain number of practitioners always adhered more or less closely to the old practice,‡ which in recent times has secured the confidence of some of the most approved writers on this subject.§

In ordinary acute diarrhœas these remedies are quite unnecessary, and the popular practice of indiscriminately administering whiskey or brandy, with or without aromatics, for simple attacks of this disorder not unfrequently aggravates the inflammation and transforms a trifling into a serious affection. In acute dysentery, whether of the catarrhal or of the diphtheritic kind, stimulants of every sort should be avoided at the commencement of the disease, and in the catarrhal form they can often be advantageously dispensed with in all its stages; yet we may still with advantage hold fast to the practice of the ancients, and begin the administration of stimulants in either variety of dysentery so soon as the strength of the patient begins to fail. This may occur in any severe or protracted case, but it is especially likely to happen in the diphtheritic cases after sloughs have formed, and during the process of separation; stimulants are then required precisely as they are in external gangrenous processes, and should be liberally administered. Claret mixed with water may often be advantageously used as a drink before the stronger wines are needed. Sherry and other generous wines should be diluted with whey or water when first employed. Later in the disease, brandy or whiskey may be given mixed with milk, or in the form of toddy. In all cases care should be taken to proportion the quantity of alcohol given, whatever be its form, to the actual wants of the patient; nothing is gained by the administration of excessive potations; at the same time the significance of alcohol as food should be borne in mind in those cases in which other food is rejected, or only tolerated in insufficient quantities. When distilled liquors are used for this purpose they should, as

* We have just seen—in the last note—that FABRICIUS HILDANUS objected to the use of wine if fever or signs of inflammation be present, and we learn from DEGNER—same note—that some of the physicians of his own time, whom he declares to be "morbi genium ignorantes," argued against its employment. Sir JOHN PRINGLE—*Obs. on the Dis. of the Army*, Part III, Chap. 6, in his first edition, London, 1752, p. 287—does not refer to the question of the use of stimulants, except to say that his patients were not allowed "small beer" even during convalescence. In his 3d edition, London, 1761, p. 247, he says he allowed his convalescents "water with a spoonful or two of rum or brandy to a pint." In his 4th edition, London, 1764, p. [illegible] he seems to have repented even of this indulgence, declaring, "I allow of no fermented liquor nor spirits, and this statement is repeated in subsequent editions: *vide* 7th ed., London, 1774, p. 285. It was, however, undoubtedly the great authority of ZIMMERMANN—Cap. 7, S. 160 *et seq.*, *op. cit.*, p. 148, *supra*—that gave currency to the opinion that it was best to abstain from alcoholic beverages. He declared that in the Swiss epidemic both wine and brandy proved altogether noxious; classed them, on account of their ill effects, with aromatics and astringents, as things to be wholly avoided, and severely censured the domestic mixtures of ginger, pepper, wine, brandy, &c., employed by the peasantry.

† BROUSSAIS—T. III, p. 208 *et seq.*, *op. cit.*, p. 643, *supra*—adopted in the treatment of dysentery an antiphlogistic regimen so rigid as to have declared even rice-water too irritating: "L'eau de riz serait encore trop irritante, parcequ'elle exige un léger travail digestif," of course he ordered "l'abstinence de toutes les boissons stimulantes," p. 209, and declared that even after the tenesmus and tormina had subsided, indulgence in wine provoked the disease to new progress, p. 218. Yet it is worthy of note that BROUSSAIS himself recommended the cautious use of wine in chronic cases, it should be given in small quantities and only with the meals; at first it should be diluted with water, afterwards it might be used pure, but only a little at a time, as long as any traces of general *éréthisme* could be recognized, p. 226.

‡ Thus PINEL—T. II, p. 334, *op. cit.*, p. 605, *supra*—advised the use of wine when dysentery is complicated with adynamic fever and in the chronic cases, p. 337. FOURNIER et VAIDY—p. 390, *op. cit.*, p. 362, *supra*—permitted a little wine during convalescence, preferably the generous wines of the south rather than the acid wines of the north, but they declared that it is necessary to be very circumspect in the use of wine. ANNESLEY—Vol. II, p. 299, *op. cit.*, p. 621, *supra*—permitted a little wine in the advanced stages of dysentery, especially in the cases of those who have been in the habit of using spirituous and intoxicating liquors." In chronic diarrhœa and dysentery he declares "wine ought not to be exhibited, unless the powers of life require to be rallied. We have seen the too early permission to take a single glass of wine bring back the acute symptoms, and have often witnessed chronic forms of the disease converted into the acute by such imprudence," p. 303. According to HAUFF—S. 438 *op. cit.*, p. 531, *supra*—wine is as much injurious in dysentery; a single teaspoonful will often produce abdominal pain; nevertheless in certain cases it is advantageous; thus in primarily typhous dysentery the red or white wines may be required, S. 452; in the nervous paralytic cases, mulled wine or punch, S. 454, and in chronic dysentery, good old red wine, S. 455. VOGT—S. 162, *op. cit.*, p. 645, *supra*—permitted the use of good red wine even before convalescence sets in, and declares that although sometimes it irritates the intestine and provokes fever, yet very often it is well borne, and acts as a genuine restorative to the patient.

§ For example, SAVENAC—p. 463, *op. cit.*, p. 620, *supra*—although he declares "les vins et les alcooliques peuvent être extrêmement nuisibles aux dysentériques," points out that there are many exceptions to this rule, and advises wines, "even generous wines, which never [illegible] and during convalescence. HEUBNER—S. 547, *op. cit.*, note *, p. 529, *supra*—to support the failing strength, in diphtheritic cases, recommends grog, punch, wine soup, &c.

a rule, be so diluted that the alcohol shall not exceed twenty to twenty-five per cent. of the mixture. Only in extremely adynamic conditions, when the stomach is not irritable, and especially in the case of patients accustomed in health to the habitual use of these drinks, does it seem prudent to use whiskey or brandy undiluted.* In the chronic fluxes some kind of alcoholic drink is very generally useful, especially when taken in connection with the food. The selection and quantity must be determined by the degree of general debility and the condition of the digestive processes. Claret and water will be sufficient for some cases; others will require the stronger wines or the alcoholic liquors.

The general principles thus sketched were followed by many of our best medical officers during the civil war. There were, however, not a few who were too apt to look upon every serious case of flux as one of "chronic diarrhœa," and to prescribe stimulants forthwith. It is not possible to determine from the records the extent of this error, or to give numerical expression to the evil effects which undoubtedly resulted.†

THE FOOD.—It should be remembered that in all the intestinal fluxes the digestive powers are diminished, and this in proportion to the severity of the disease. Lesions of the functions in question become especially marked in acute diarrhœa or dysentery when accompanied by fever, and in diphtheritic dysentery, whether fever is recognizable or not. In severe cases of diphtheritic dysentery the disorder may even amount to complete abolition of the digestive functions, and between this extreme apepsia and the most trifling diminution in the digestive activity all degrees exist. It is therefore the duty of the physician in every case to observe the condition of the patient in this respect, and to proportion the quantity and character of the food to his digestive capabilities.‡ Some of the physicians of antiquity recommended total abstinence during the first day or two of an attack of acute dysentery,§ and it must be admitted that during this period it is advantageous to reduce the food to a minimum both in dysentery and in serious cases of acute diarrhœa. At this time barley water, rice water, gum water or other *feebly nourishing drinks* may be prescribed with advantage, and their use may be continued for some time during the subsequent progress of the disease, if they are relished by the patient, though not to the exclusion of more nourishing food.

A great variety of these drinks were prescribed by the physicians of antiquity, most of which have fallen into disuse, while some are still employed at the present time.‖ They were believed to dilute the acrid humors in the alimentary canal, thus rendering them less

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* In this I agree with the cautious advice of UFFELMANN—p. 250, *op. cit.*, p. 388, *supra*.

† On the use of alcoholic drinks in acute dysentery during the civil war, see, in Sect. II, the reports of COUES, p. 64; MULFORD, p. 80; W. H. BROWN, p. 81; WALTON, p. 93; and COFFMAN, p. 97. In chronic dysentery, STORROW, p. 43. In "diarrhœa," POTTER, p. 83; HILL, p. 88; TOMPKINS, p. 90. Compare also the reports of those cases, in Sect. III, in which the treatment is recorded, *e. g.*, cases 203, 206, 213, 216, 224, 247, &c.

‡ GALEN so well appreciated these digestive difficulties that he declared—*De Remediis Parabilibus*, Lib. I, Cap. 13, [Ed. Kühn, XIV, p. 379,]—that the very best remedy for dysentery is a scanty diet, and that whatever is given should be easy of digestion. ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 434, Ed. cited p. 624, *supra*—wrote: "A dysenteric, on account of the imbecility of the stomach and intestines, cannot digest much, especially when he has fever." UFFELMANN—*op. cit.*, p. 388, *supra*—in a suggestive essay, has recently attempted to discuss this digestive debility in the light of modern physiological knowledge.

§ Thus ALEXANDER OF TRALLES—p. 435, Ed. cited last note: "Primis duobus diebus abstinentiam indicimus."

‖ Barley water, prepared by boiling husked barley, with or without the addition of small quantities of other substances, may be taken as the type of these preparations. Under the designation ptisan its use in acute diseases is treated at great length in the Hippocratic treatise *De Victus Rat. in Morb. Acut.*, [Ed. Littré, II, p. 245 *et seq.*] GALEN regarded it as worthy of a special work—*De Ptisana Liber*, [Ed. Kühn, VI, p. 816,]—and thought it possessed detergent and lubricating, as well as nutritive, properties. The modern French physicians give the name of tisanes not only to these drinks and others referred to in the text, but to various infusions and decoctions of herbs, &c. Among other demulcent and subastringent drinks recommended by GALEN in dysentery, I may mention decoction of rice with plantain—*De Rem. Parab.*, Lib. I, Cap. 13, [Ed. Kühn, XIV, p. 380,]—decoctions of pomegranates and quinces—*loc. cit.*—and decoction of marsh-mallow (althæa)—*De Simpl. Med. Temp. ac Fac.*, Lib. VI, Cap. 5, [Ed. Kühn, XI, p. 867:] it would be easy to name various others. ALEXANDER OF TRALLES—p. 440, Ed. cited p. 624, *supra*—gave special directions for the use of ptisan in dysentery, and under certain circumstances mixed honey with it. He also advised in the early stages of the disease the use of decoctions of rice, spelt and other farinaceous articles, strained and mixed with a little milk, &c. Among more modern writers, compare the remarks on the use of such substances by FAB. HILDANUS—p. 679, *op. cit.*, p. 644, *supra;* SENNERTUS—T. III, p. 183, *op. cit.*, p. 645, *supra;* and FRID. HOFFMANN—T. III, p. 156, *op. cit.*, p.

irritating; to wash away the intestinal contents and cleanse the ulcerated surfaces, while the more mucilaginous and glutinous preparations were supposed to sheathe the mucous membrane, and thus to protect it against further erosion or abrasion by the humors that might subsequently descend; for this latter purpose fatty matters of various kinds were occasionally prescribed; moreover great importance was attached to the addition of various fruits and herbs believed to be possessed of mild astringent properties.*

These views have for the most part entirely lost credit. The admixture of astringents is not to be thought of except under circumstances to be discussed hereafter, when astringent medication is indicated, and I presume that at the present time most physicians will agree with Savignac† in regarding the other supposed results as altogether illusory. So far as any diluent or cleansing effect is concerned, these drinks can only act in virtue of the water they contain, and as this is rapidly absorbed in the stomach or upper part of the small intestine, they cannot be expected to exercise any perceptible influence upon the mucous membrane of the colon. Indeed, if we may judge from the earnestness with which they insisted upon the simultaneous use of the same fluids as enemata,‡ the Greek physicians must themselves have been aware that the effects hoped for are not fully obtained when diluent or emollient liquids are given by the mouth alone.

So, too, any protective sheathing of the mucous membrane by the administration of glutinous or fatty substances must, at present, be regarded as in the highest degree improbable. The starchy, saccharine, gummy and fatty substances which may be used for this purpose are not merely modified by the digestive process to an extent varying with its activity in each individual case, but the undigested portions submit at the temperature of the body to divers fermentations and decompositions, the products of which may themselves exercise an irritating effect upon the inflamed mucous membrane. The beneficial effects of such drinks, then, beyond the introduction of so much water into the blood, which could be equally well effected by drinking water alone, depend merely upon the small quantities of nourishment they contain, and upon the fact that this nutriment is the more manageable by the enfeebled digestive organs because it is presented in a liquid form. Any excess in the amount of the alimentary principles thus administered beyond what can be completely digested is to be regarded as altogether injurious.

Among the articles of this class the *white decoction* of Sydenham long enjoyed a great reputation. It consisted of two ounces each of bread crumbs and calcined hart-horn,

647, *supra*. DEGNER—Cap. III, § 61–69, p. 169 *et seq.*, *op. cit.*, p. 625, *supra*—attached extreme importance to a decoction of salep; ZIMMERMANN—Cap. V, S. 82 *et seq.*, *op. cit.*, p. 648, *supra*—to barley water, which he gave in large quantities, adding often an ounce of cream of tartar to each quart. FAB. HILDANUS—p. 676, *op. cit.*—lauded especially the use of an emulsion of sweet almonds, and this preparation long enjoyed considerable popularity, but was finally abandoned on account of its tendency to undergo fermentation in the alimentary canal. Solutions of gum Arabic and tragacanth, employed already by the Greek physicians, (see ÆTIUS—Tetrab. III, Serm. I, Cap. 47, p. 663, Ed. cited p. 641, *supra*. "Obtundit autem tragacanthus et gummi,") were recommended by the Arabians (see AVICENNA—Lib. III, Fen 16, Tract. 1, Cap. 4, p. 817, Ed. cited p. 632, *supra*) and the majority of subsequent physicians, among other preparations of this class, but acquired undue importance from the teachings of BROUSSAIS—T. III, p. 213, *op. cit.*, p. 643, *supra*—who thought even rice water too irritating. It may well be doubted whether these solutions possess any advantage over so much water. Various mixtures containing wax as their base have also enjoyed considerable reputation. DIOSCORIDES—Lib. II, Cap. [illegible] Paris, 1549, fol. 98—mentions this use of wax as well known in his time: "Datur in orbitione dysentericis." It may be dissolved in hot milk, or made into a mixture by the aid of gum Arabic or soap. DEGNER—Cap. 3, § 85, p. 220 *op. cit.*—Cites a number of authorities according to whom the preparation with milk exercised a marked curative effect, especially in camp dysentery. PRINGLE—Part III, Cap. 6, p. 273, Ed. cited p. 641, *supra*—mentions other authorities in its favor, and also states that HUCK had used a mixture, in which soap was used as a dissolvent of the wax, with good effects in treating dysentery in the British military hospitals in North America. Several formulæ for making emulsions of wax with the aid of gum Arabic, &c., are cited by NAUMANN—Ed. IV, Abth. 2, S. 82, *op. cit.*, p. 645, *supra*—who, however, was too well instructed to attribute any importance to their use, and expressed the opinion that the chief benefit to be expected from them was the exclusion of more dangerous medication, "man, indem man ihnen vertraute, um so eher von den gefährlichen adstringirenden und anderen gerühmten Specifics die Hand entfernt hielt."

* These indications, which will be found more or less fully expressed in almost all the older medical writings on dysentery, are nowhere more clearly expounded than by VAN SWIETEN—*Comm. in H. Boerhaave Aphorismos*, T. II, Leyden, 1745, § 732, p. 388—who points out that water is indeed the only diluent in these cases, but that various saponaceous, emollient, oily and earthy substances are added to it in accordance with the nature of the irritating acrimony supposed to exist in the bowels.

† SAVIGNAC—p. 478, *op. cit.*, p. 620, *supra*.

‡ See the remarks on enemata, *infra*.

boiled in spring water from three pints to two, and sweetened with white sugar.* Disused in this country and Great Britain, it has continued to find favor in France, and Savignac declares it to enjoy the confidence of the French practitioners not merely as an aliment but on account of its medicinal virtues in both diarrhœa and dysentery.

Another preparation, of a more nourishing character, is the *solution of albumen*, suggested in 1835 by Bodin. It is made by beating up the whites of eggs with water, sweetening the mixture with white sugar and flavoring with some aromatic water. Extraordinary results are said to have been obtained from its use, especially by Mondière,† which have been explained by some as resulting from a supposed emollient action upon the mucous membrane of the large intestine, by others to its furnishing a form of nutriment especially adapted to replace the loss of blood albumen due to the presence of this substance in the dejections. Subsequent experience has not justified the extravagant claims made for this form of liquid food, but it undoubtedly offers some advantages in the alimentation of dysenteric patients, especially in cases in which milk is not well digested.

No article of diet played a more considerable part in the management of dysentery, as practiced by the ancients, than *milk*. It was given in the early stages of the disease in the form of whey, in which sometimes red-hot flints or pieces of iron were quenched, for the purpose of adding strengthening or astringent properties. Subsequently boiled milk, and still later in the disease unboiled milk was used. There was a choice in the kind of milk employed. That of goats was supposed to be tolerated before cows' milk, and cooked milk earlier than raw. The milk might be mixed with water or given pure. Honey might be added to increase its laxative and detergent properties, in virtue of which it was regarded as medicine as well as food. Barley, rice and other farinaceous substances were boiled in it to increase its nutritive value, and eggs were sometimes added for the same reason. It was fully recognized that under certain circumstances, especially at the beginning of dysentery, and when fever was present, milk was not well borne; but with these exceptions its use was regarded as a most important part of the treatment.‡

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* SYDENHAM—*Med. Obs.*, Sect. IV, Chap. 3, Vol. I, p. 171, Ed. cited note †, p. 407, *supra*. The burnt hartshorn (which consists chiefly of bone phosphate of lime with a little free lime) had long been used as a remedy in dysentery: compare GALEN—*De Rem. Parab.*, Lib. I, Cap. 13, [Ed. Kühn, XIV, p. 380.] DAVID MACBRIDE—*A Methodical Introduction to the Theory and Practice of Physic*, London, 1772, Part II, Book III. Chap. 3, p. 468—mentions the white decoction of SYDENHAM among the articles of diet suitable for dysenterics. TROUSSEAU—*Clin. Méd. de l'Hôtel-Dieu de Paris*, 2me Éd., Paris, 1865, T. III, p. 171—states that he attaches great importance to its use. For the remarks of SAVIGNAC referred to in the text see p. 469, *op. cit.*, p. 620, *supra*.

† PAYEN—*Note sur la substitution de l'albumine au caséum*, Jour. de Chimie Méd., T. VI, 1830, p. 138—had previously recommended the use of albuminized water in the alimentation of the sick as a substitute for milk when this was not well digested by the patient. BODIN *(de la Pichonnerie)—Usage de l'eau albumineuse dans le traitement de la dysenterie*, Jour. des Connaissances Medico-Chirurgicales, An II, 1834-5, p. 309—recommended the whites of five or six eggs to the litre of water and an ounce and a half of powdered sugar, to be well shaken in a bottle; some bird shot are introduced into the bottle to facilitate the mixture; a little orange-flower water, mint or any agreeable flavor is added. The whole may be given in the twenty-four hours in divided doses. He often administered also three or four injections daily, composed each of the white of an egg beaten with water in the same way. J. T. MONDIÈRE—*Mémoire sur le traitement de la dysenterie par l'albumine donnée en boissons et en lavemens*, L Expérience, T. III, 1839, pp. 97 and 113. This paper is illustrated by a number of cases successfully treated in the manner described above. The author remarks: "The efficacy of this treatment is such that we have seen very grave dysenteries yield in the course of 12 to 24 hours without leaving, so to say, a trace of their existence," p. 100. TROUSSEAU—*loc. cit.*, *supra*—has commended the use of albuminized water in dysentery, and SAVIGNAC—*op. cit.*, p. 620, *supra*—who has discussed the subject with commendable prudence, concludes: "I do not, then, rely on the exclusive employment of albumen in the treatment of dysentery, but I have entire confidence in albuminous alimentation, one of the most rational deductions of the experimental physiology of digestion," p. 388. I may add that ÆTIUS—Tetrab. III, Serm. 1, Cap. 45, p. 608, Ed. cited p. 644, *supra*—mentioned the use of raw eggs in the alimentation of malignant dysentery; and that the albumen of eggs was commended as an injection in dysentery by AVICENNA—Lib. II, Tract. 2, Cap. 527, p. 367, Ed. cited p. 632, *supra*: "Et ex albumine quidem ipsorum fit elysterè cum meliloto propter ulcera intestinorum, et putrefactionem eorum."

‡ The following references will serve to illustrate the statements of the text: A detailed account of a case of dysentery treated chiefly with milk will be found in the Hippocratic treatise *De Morb. Vulg.*, Lib. VII, § 3, [Ed. Littré, V, p. 369.] He took whey at first, then boiled asses' milk, and finally raw cows' milk; the quantity of milk used was about a litre daily. ARCHIGENES—in ÆTIUS, Tetrab. III, Serm. 1, Cap. 45, p. 604, Ed. cited p. 644, *supra*—recommended in the treatment of dysentery after the third day, if the fever permitted, the use of fresh milk mixed with honey, and we learn from CŒLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 6, Amsterdam, 1709, p. 526—that DIOCLES had advised the same mixture, attributing to it purgative qualities. PHILUMENUS—see ÆTIUS, Tetrab. III, Serm. 1, Cap. 35, p. 585—commended the use of recently milked cows' or goats' milk drunk warm, or milk in which heated stones or pieces of iron had been quenched, in diarrhœa and other alvine fluxes. See also the detailed account of the use of milk in dysentery in the *Natural History* of PLINY, Lib. XXVIII, Cap. 33. GALEN—*De Simpl. Med. Temp. ac Facultat.*, Lib. X, Cap. 2, [Ed. Kühn, XII, p. 267]—affirmed that whey, in which heated flints or cylinders of iron have been quenched, is the very best remedy for dysentery and all acrid fluxes from the bowels: milk could be advantageously treated in the same way. In the same chapter (pp. 291-2) he states that the addition to milk thus

Amatus Lusitanus (1557) appears to have been one of the first to raise his voice against its free employment. He emphasized the dangers of its use when fever is present, which had long before been insisted upon by Alexander of Tralles, and declared that it ought not to be given to those who have bilious stools, whether fever is present or not. These objections, fiercely combatted by some physicians, convinced many others.* Sennertus, who still adhered to the ancient practice, has left a dissertation in which the views entertained in his times by the conflicting parties are fairly summarized.† But, notwithstanding his advocacy, the employment of milk in dysentery was gradually abandoned. Hoffmann thought it should be only used when diluted with water and boiled. Pringle advised the admixture of lime water in case the milk by itself should "turn sour on the stomach." Zimmermann objected to using it at all,‡ and his example has been followed, until quite recently, by the majority of physicians in spite of the extravagant accounts given by Pouppé Desportes and Dalmas§ of the benefits they derived from its use in the treatment of fluxes in the West Indies. Indeed many modern physicians agree with Savignac‖ in condemning it as positively injurious.

Pécholier has nevertheless revived the milk diet with considerable success, and still more recently it has been beneficially employed in the French naval hospitals for the treatment of cases of the chronic fluxes of Cochin China.¶ I confess I incline to believe that there are many other cases in which the ancient use of milk in the treatment of the fluxes might be revived with advantage. Mixed with lime water, it is often well borne

prepared of the feces of dogs fed on bones only, makes a remedy for dysentery of quite wonderful virtues. This disgusting mixture was protested against by ALEXANDER OF TRALLES—p. 465, *op. cit., infra*—who declared that it was unreasonable to use such substances when we have so many other less objectionable yet efficacious medicaments; but in spite of such intelligent criticism it still enjoyed the favor of physicians as late as the latter part of the 16th century. Compare NICOLAUS PISO—*De Cognoscendis et Curandis præcipue Internis Humani Corporis Morbis*, Lib. III. Cap. 15, p. 474, Frankfort 1580. In the treatise *Ad Pisonem De Theriaca*, Cap. 9, [Ed. Kühn, XIV, p. 241,] GALEN praises the use of cows' milk as advantageous in dysentery. His writings contain numerous other precepts with regard to the use of milk, both in the fluxes and other diseases, which the curious reader will find indexed under the heading *Lac* in the last volume of Kühn's edition. For a long time subsequent writers added little or nothing to these precepts. Compare ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 435 *et seq.*, Ed. cited p. 624, *supra*—who has treated of the use of milk in dysentery in his usual concise manner. He preferred goats' milk to all others, next that of the cow, the milk of the horse or ass being less esteemed. Especially has he emphasized the objections to the administration of milk if there is fever, because it acidifies or corrupts on the stomach. See also PAULUS ÆGINETA—Vol. I, pp. 521 and 526, Ed. cited p. 624, *supra*—and FAB. HILDANUS—p. 676, *op. cit.*, p. 644, *supra*—who commends the milk of a human female as best of all; "lac quoque muliebre summopere convenit."

* AMATUS LUSITANUS—Cent. II, Obs. 44, p. 287, *op. cit.*, p. 656, *supra*—based his opinion chiefly upon his own observation, declaring: "Et nos longa experientia, ita evenire sæpe observatum habemus;" but he cites the opinions of various writers in support of his view, particularly a passage from HIPPOCRATES—Aph. V, 64. [Ed. Littré, IV, p. 557.]—in which it is declared that milk ought not to be given to persons having headache, fever, bilious discharges in acute fever, &c. These views were vigorously criticised, among others, by ZACUTUS LUSITANUS—*De Med. Princip. Hist.*, Lib. II, Quæst. 46, Comm., Opera, Lyons, 1649, Vol. I, p. 333.

† SENNERTUS—T. III, p. 188, *op. cit.*, p. 645, *supra*, Quæstio 5: "An lactis usus in dysenteria conveniat?"

‡ HOFFMANN—T. III, p. 158, *op. cit.*, p. 647, *supra*—objected to pure milk in dysentery particularly on account of its tendency to coagulate in the bowels. PRINGLE—Part III, Chap. 6, p. 283, Ed. cited p. 640, *supra*—in the last edition of his work, favored the use of "a milk- and farinaceous diet," and complains that "in large hospitals, the soldiers cannot be fully supplied with milk;" it is only in the case mentioned in the text that he recommended that "a third part of lime-water" should be added—p. 284. ZIMMERMANN—Cap. IV, S. 72, *op. cit.*, p. 648, *supra*. Elsewhere—Cap. X, S. 426—he states that PRINGLE did not allow milk to his patients, even when convalescent, unless it was diluted with lime water, as he found that milk by itself had a tendency to increase the gripings. This view was indeed expressed by PRINGLE in his first edition—London, 1752, p. 287—but he lived to take a more favorable view of the use of milk, as has just been shown.

§ J. B. R. POUPPÉ DESPORTES—*Hist. des Maladies de St.-Domingue*, Paris, 1770, T. II, p. 106 *et seq.*—in speaking of the treatment of the hepatic flux, affirmed that there is no more salutary remedy than milk for the majority of patients; indeed, that "without it more than two-thirds of them would perish." Further on—p. 111—he speaks of the usefulness of milk in the alvine fluxes generally (des flux de ventre) and in convalescence from dysentery &c. DALMAS—*Diss. sur une espèce particulière de diarrhée*, Paris Thesis, No. 147, 1808—claims to have used a preparation of milk and salep with great advantage in the "diarrhée scorbutique" of the Antilles, and relates in detail several illustrative cases.

‖ SAVIGNAC—*loc. cit.*—remarks: "Zimmermann en défend formellement l'emploi, et je me range à son avis." He declares that nothing but inconvenience can result from giving it as a drink, even when diluted with water or any ptisan, and that although it may occasionally be given if demanded by the caprice of a patient, it ought not to enter into the habitual alimentation of dysenteries.

¶ G. PECHOLIER—*Des indications de l'emploi de la diète lactée dans le traitement de diverses maladies et spécialement dans celui des maladies du cœur, de l'hydropisie et de la diarrhée*, Montpellier Medical, T. XVI, 1866, p. 429, T. XVII, 1866, pp. 1 and 197. The first of these papers has an interesting summary of the history of the use of milk in medicine; the last refers particularly to its use in diarrhœa. LOUIS FLEURY—*Traitement de la dysenterie chronique*, Archives de Méd. Navale, T. XVI, 1871, p. 311—declared, a few years later: "Pour moi, le régime exclusivement lacté, continué pendant un temps plus ou moins long suivant les indications, constitue l'alimentation la plus convenable" for chronic dysentery. Still later the milk diet came into general use in the French naval hospitals for the chronic fluxes of Cochin China. Favorable accounts of its success in the hospital at Brest have been given by E. BARRET—*De l'emploi du lait dans le traitement de la dysenterie chronique*, same Jour., T. XX, 1873, p. 370; and H. BIZIEN—*Contribution a l'étude du traitement de la dysentérie chronique coloniale par la diète lactée*, Paris Thesis, No. 306, 1873. For the hospital at Rochefort by L. C. CLAVEL—*De la dysentérie chronique des pays chauds et de leur traitement par la diète lactée*, Paris Thesis, No. 233, 1873; and for that at Cherbourg by C. M. J. HODOUL—*De la médication lactée dans la dysenterie et la diarrhée chroniques*, Paris Thesis, No. 302, 1873.

even in the early stages of acute dysentery. In the advanced stages of the diphtheritic form of the disease, when it becomes necessary to support the strength of the patient, it can frequently be given with advantage in the form of milk punch made with whiskey or brandy, and the same preparation is exceedingly serviceable in debilitated chronic cases. In ordinary acute diarrhœa and in the chronic fluxes, milk given by itself, especially if boiled, often proves an easily digestible and nourishing article of food, and it may frequently be beneficially combined with the farinaceous articles of diet, rendering them both more agreeable and more nourishing. Prudence in its use is, however, required, and it should not be urged upon patients to whom it is distasteful, or with whose digestion it evidently disagrees.

The use of *whey* continued to find supporters long after doubts began to be entertained with regard to milk. Sydenham employed it freely; Baglivi praised it in extravagant terms; it was commended by Hoffmann, Degner and Zimmermann.* In more modern times it has been extensively prescribed, with the addition of sherry or some similar wine, under the name of wine whey. The ancients ascribed to it laxative and detergent properties,† and employed it freely both by the mouth and as an enema. Savignac,‡ who objects to its habitual use in the alimentation of dysenterics, admits its laxative virtues, and favors its employment as an adjuvant with manna or tamarinds. I do not attach much importance to its use for this or any other purpose, and think there is no cause to regret the neglect into which it has recently fallen.

*The farinaceous articles of food* have always held a prominent place in the alimentation of diarrhœa and dysentery. The Greek physicians employed bread of various kinds soaked in water or boiled with milk, and a great variety of gruels, prepared with or without milk, from barley, rice, wheat flour, oatmeal, starch and other farinaceous articles still in use, as well as some that have become obsolete.§ To these, commerce with the East Indies has added sago, and America has contributed tapioca and potatoes.‖ It was long considered advantageous to cook astringent herbs or fruits with these preparations;¶ a pernicious practice which has fortunately been abandoned. With this change the farinaceous preparations have continued to enjoy a widespread popularity until the present time.

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* SYDENHAM—*Med. Obs.*, Sect. IV, Cap. 3, Vol. I, p. 174, Transl. cited p. 407, *supra*. BAGLIVI—*Praxeos Med.*, Lib. I, Cap. 9, Lyons, 1699, p. 78—declared that he often cured dysentery with whey alone, given both interually and in clysters. HOFFMANN—T. III, p. 158, *op. cit.*, p. 647, *supra*. DEGNER—Cap. III, § 77, p. 192, *op. cit.*, p. 625, *supra*—not merely commended the use of whey, by which he said he had obtained the best results, but preferred to use it in a subacid condition, and even sometimes substituted buttermilk, or even milk itself a little sour—p. 310—regarding the acidity of importance in neutralizing the alkaline bile which played so great a part in his conception of the disease. ZIMMERMANN—Cap. IV, S. 72, *op. cit.*, p. 648, *supra*—"allowed whey in great plenty, and preferred it to water" as a drink.

† See especially the account of the virtues and medical properties of whey given by GALEN—*De Simpl. Med. Temp. ac Fac.*, Lib. X, Cap. 2, § 8, [Ed. Kühn, XII, p. 266.]

‡ SAVIGNAC—p. 466, *op. cit.*, p. 620, *supra:* "Ce n'est pas, au surplus, l'une de mes boissons favorites, et je le réserverais volontiers pour servir seulement de véhicule adjuvant à certains purgatifs."

§ The properties of these farinaceous articles have been discussed at length by GALEN in the first book of his treatise *De Aliment. Facultatibus*, [Ed. Kühn, VI, p. 453 *et seq.*] In Cap. 17, p. 525, he lauds the virtues of rice in checking alvine fluxes. Twice-baked bread and flour boiled with milk are mentioned by CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 6, p. 526, *op. cit.*, p. 664, *supra*—as having been used for the diet of dysenterics by PRAXAGORAS. Directions for the use of farinaceous articles of various kinds, with or without milk or eggs, will be found in ÆTIUS—Tetrab. III, Serm. I, Cap. 45, p. 604, Ed. cited p. 644, *supra;* ALEXANDER OF TRALLES—pp. 433 and 438, *op. cit.*, p. 624, *supra;* and very many of the subsequent writers on dysentery.

‖ Sago is praised by DEGNER—Cap. III, note to § 70, p. 182, *op. cit.*, p. 625, *supra*—who also comments favorably on the use of potatoes, saying that he allowed his patients to indulge in them throughout the whole period of the Nimeguen epidemic, and saw no harm result from their use. He describes them as, "tubera illa Americana, quæ a quibusdam Patatos et Patatoes, ab aliis Papas Americanum ab aliis solanum tuberosum esculentum vocantur." Tapioca, so far as I can learn, was first recommended as an article of diet in dysentery by PISO—*De Med. Brasiliensi*, Leyden, 1648, Lib. II, Cap. XIV, p. 30—who extolled it above all similar articles, and ascribed to it wonderful refrigerating and healing virtues.

¶ This was practiced by the Greek physicians, and CELSUS—Lib. IV, Cap. 15—advised that the food and drink in dysentery should consist of those things that bind the bowels gently; but no one has more fully insisted upon it, or carried the plan of admixing such astringents to a greater extreme, than FAB. HILDANUS—Cap. 7, p. 676 *et seq.*, *op. cit.*, p. 644, *supra*—who mixed astringents with soups and broths as well as with the farinaceous foods. Traces of the practice will be found in the writings of HOFFMANN—T. III, p. 156, *op. cit.*, p. 647, *supra*. DEGNER appears to have been the first to abandon this vicious custom, and recommends gruels of barley, oatmeal, millet and rice, prepared with milk, as well as various gelatinous broths, to be employed without any astringent mixture—p. 188, *op. cit.*, *supra*.

Savignac and Barrallier have discountenanced their use, giving the preference to nitrogenous food as better adapted to gastric digestion; if farinaceous articles are used at all, Savignac prefers such preparations as vermicelli, semolino, etc., which are rich in gluten, rather than ordinary bread, or, still worse, the preparations consisting almost exclusively of starch.* These objections are not without force, but it is possible to go too far in this direction. Conditions certainly occur in the early stages of acute dysentery which, so long as they exist, render the administration of any considerable quantity of starchy food injudicious. When the anorexia is extreme, and almost anything introduced into the stomach excites vomiting, it is, of course, worse than useless to attempt to force such food upon the patient. Moreover, as long as the mouth is quite dry and its scanty secretions highly acid, the saliva is incapable of transforming starch, and most probably the pancreatic and intestinal juices have equally lost that power.† Under such circumstances the quantity of starchy food that can be digested is at best extremely small, and the remainder, fermenting in the alimentary canal, passes out with the stools as the so-called frogs'-spawn or sago-grain bodies,‡ after having doubtless exercised an injurious influence on the diseased mucous membrane. Even after the mouth becomes moist, and the patient begins to have some appetite, the quantity of starchy food that can be digested remains small, as shown by its appearance in the stools whenever any considerable quantity of it is taken.

Farinaceous food ought not then to be given in the early stages of acute dysentery, and even later in the disease not in excessive quantities, nor to the exclusion of nitrogenous food; but administered in moderate quantities and in connection with other diet, there seems to be no reasonable objection to it after the patient begins to have some appetite; and it has a still wider range of usefulness in non-febrile acute diarrhœa and in the chronic fluxes. Under such circumstances, too, custards composed of starchy preparations boiled with milk and eggs, sweetened and agreeably flavored, are often relished by the patients, and in moderate quantities nothing but benefit is to be anticipated from their use. Among the farinaceous articles of diet rice has probably enjoyed the highest reputation. The opinion of Galen,§ that it exercises a restraining influence upon the bowels, has been accepted unchallenged by the majority of physicians. Boiled with milk it is still generally believed to be possessed of special anti-diarrhœic virtues, and the gruels and custards prepared from rice flour are not only supposed to share these properties, but on account of their delicate flavor are very acceptable to the patients. This high reputation appears to be based upon tradition rather than accurate comparison with other farinaceous food, and doubtless the good qualities of rice have been exaggerated, but I cannot agree with Savignac,‖ who has carried his prejudices against it to the extent of proscribing its use.

Any of these preparations, if given at all, may safely be sweetened to taste. The older physicians had a prejudice against the use of sugar in dysentery, because they supposed it to be readily converted into bile, and loaf-sugar was regarded as particularly objectionable, because the lime used in refining it was believed to confer a certain degree of acrimony upon it.¶ This prejudice has long been deservedly abandoned. Yet it should not be

* SAVIGNAC—p. 455, *op. cit.*, p. 620, *supra*; BARRALLIER—p. 785, *op. cit.*, p. 03, *supra*.

† Compare UFFELMANN—*op. cit.*, p. 388, *supra*. ‡ See p. 375, *supra*. § See note §, p. 666, *supra*.

‖ SAVIGNAC—*loc. cit.*—declares that rice, "which an absurd prejudice regards as anti-diarrhœic, although it gives indigestions or diarrhœa to many persons," is one "of the aliments which are least suited to dysenterics, above all when it is mingled with milk." BARRALLIER—*loc. cit.*—directs that the physician "should proscribe farinaceous food, and above all rice."

¶ Compare FAB. HILDANUS—Cap. 7, p. 680, *op. cit.*, p. 644, *supra*. The opinion that sugar turns into bile is based upon a similar utterance of GALEN with regard to honey—*De Aliment. Fac.*, Lib. III, Cap. 39, [Ed. Kühn, VI, p. 712.] See also SENNERTUS—T. III, p. 184, *op. cit.*, p. 645, *supra*—who clearly expresses the same views.

forgotten that in the same conditions of digestive debility in which the starches escape transformation, the power of transforming cane into grape sugar is also diminished or lost, and that the temperature of the body is favorable to its fermentation. Under such circumstances it should be cautiously used or altogether avoided, and even later in the disease it is well to be moderate in its employment. In the conditions of extreme apepsia just referred to, it has been proposed to administer a solution of grape sugar, as affording the form of nutriment produced in normal digestion from the starchy and saccharine articles of diet without taxing the enfeebled digestive organs. Doubtless there may be conditions in which this solution might be advantageously resorted to, though experience is lacking to define the limits of its usefulness; but it is evident that if too concentrated, or administered in excessive quantities, so much of the sugar as is not absorbed would be especially prone to undergo fermentative changes, the products of which could not but exercise a mischievous influence upon the diseased mucous membrane.*

The *fats* should, as a rule, be avoided in the alimentation of acute dysentery, and should only be allowed with moderation in non-febrile diarrhœa or the chronic fluxes.† The ancient practice of administering oily substances for their supposed detergent properties, or with the expectation of sheathing the mucous membrane and protecting it against the excoriating action of acrid humors, has long since lost credit, although the use of castor oil as a purgative continues to find favor among some modern physicians.‡ As aliment in acute dysentery the fats are objectionable, because they are not easily digested and because they readily undergo decompositions by which the fat acids are set free in the alimentary canal, where they cannot but exert an unfavorable influence. Moreover, the diminution or cessation of the secretion of bile during the acute stages of the disease is, as Uffelmann§ has pointed out, an additional reason for the difficulty with which the fats are digested at this period, and it is well to abstain from them until the hepatic secretion is restored.

*Nitrogenous food.*—All kinds of fish and flesh in the solid form were regarded by the Greek physicians as unsuitable diet for patients laboring under acute dysentery; yet when the disease became chronic, as well as during convalescence, they allowed with caution the use of broth.‖ Fish that live among the rocks were supposed to be especially suitable, and the flesh of wild birds and quadrupeds to be preferable to that of domesticated animals.¶ Chicken broth and broth made from partridges were allowed, at least in malignant cases,

* UFFELMANN—S. 249, *op. cit.*, p. 388, *supra*—who recommends for this purpose a solution of grape sugar in water with the addition of "a little good red wine," strongly insists upon the precautions indicated in the text.

† ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 442, Ed. cited p. 624, *supra*—declared, in speaking of the use of flesh in dysentery, that "nothing fat, or difficult of digestion ought to be given." This objection to fat, constantly repeated by subsequent writers, still prevails among physicians. Thus SAVIGNAC—pp. 455-6, *op. cit.*, p. 620, *supra*—not only insists that the meat given to dysenterics shall be devoid of fat, and that the fat shall be carefully skimmed from the broths and soups administered, but would limit the use of eggs on account of the fat contained in the yolk.

‡ The use of fatty substances in dysentery to cleanse or disembarrass the bowels of their acrid contents is directed in the Hippocratic treatise *De Affectionibus*, § 23, [Ed. Littré, VI, p. 235.] On account of their supposed sheathing properties the Greek physicians administered the fats by injection even more frequently than by the mouth, as will be seen when enemata are under discussion. Without multiplying passages to illustrate their internal use, I may refer to ÆTIUS—Tetrab. III, Serm. 1, Cap. 45, p. 604, Ed. cited p. 644, *supra*—who advises that a little oil, or still better, fresh goose fat or chicken fat be added to the farinaceous paps given to dysenterics. According to FAB. HILDANUS—Cap. 9, p. 684, *op. cit.*, p. 644, *supra*—fatty broths, butter, olive oil or oil of sweet almonds may be advantageously given to relieve the pain of dysentery; and SENNERTUS—T. III, p. 184, *op. cit.*, p. 645, *supra*—declared that fat added to broth made from the flesh of castrated animals greatly moderates the pains of the disease and heals the ulcers of the intestines. With regard to the use of castor oil, I shall have something to say in connection with the subject of purgatives; meanwhile I note that SAVIGNAC, who so strongly objects to any fatty substances being given as food to a dysenteric—see last note—declares that castor oil is the purgative which he most willingly employs in dysentery—p. 363, *op. cit.*

§ UFFELMANN—S. 242, *op. cit.*, p. 388, *supra*. For a brief account of the case on which he bases this suggestion, see note †, p. 632, *supra*.

‖ ÆTIUS—Tetrab. III, Serm. 1, Cap. 45, p. 605, Ed. cited p. 644, *supra*: "Carnes autem dysentericis non valde commodæ existunt, dandæ tamen eis qui diuturno malo vexantur." ALEXANDER OF TRALLES—*loc. cit.*, note †, *supra*—explains that they are objectionable because they nourish much and are slowly digested.

¶ Compare the lists of fish and flesh given in connection with the passages cited in the last note. The rock fish (*ἰχθύες πετραῖοι*) are mentioned already in the Hippocratic account of the dysentery of the son of Eratolaus—*Epidem.*, VII, [Ed. Littré, V, p. 373;] and according to CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 6, p. 527, Ed. cited p. 526, *supra*—PRAXAGORAS specified them (pisces saxatiles) among the articles of diet which may be allowed to dysenterics.

though they seem to have been prescribed with some hesitation.* When subsequently broths, soups and gelatinous preparations, obtained by the prolonged boiling of flesh, began to enjoy popularity as a means of supporting the failing strength in all severe cases of the disease, it was thought necessary to add astringent medicaments lest they should increase the flux. I find this practice commended as late as in the writings of Hoffmann.†

In modern times various liquid preparations made from flesh have been extensively employed to support the strength of patients laboring under acute dysentery. Indeed, some physicians, reasoning from our recently acquired knowledge of the physiology of the digestive processes and of the modifications they undergo in dysentery, have been led to recommend that the diet should be confined as much as possible to nitrogenous articles. Savignac‡ especially has insisted upon this view, alleging that the digestion of food of this kind being effected chiefly in the stomach by the gastric juice, the diseased intestines are less taxed than by the use of food which is chiefly digested in the intestinal canal. But it is quite possible to go too far in this direction. On the one hand, it should be remembered that in normal digestion both the pancreatic and intestinal juices continue the work begun in the stomach of transforming the nitrogenous elements of the food into soluble peptones; on the other hand, at the beginning of acute dysentery the functions of the stomach are always impaired to an extent proportional to the severity of the disease, while at a later period various degrees of gastric catarrh are, as has been shown in connection with the morbid anatomy, of frequent occurrence.§ In the almost complete apepsia of the early stages of acute dysentery it is worse than useless to attempt to introduce more nitrogenous matter into the alimentary canal than can possibly be digested; and later in the disease, when gastric digestion again revives, the power of digesting starchy food is usually restored to a somewhat corresponding degree.

But while exclusive views of this character are open to criticism, it would be a great error to underestimate the importance of supplying nitrogenous food in an easily digested

* I find in ÆTIUS—Tetrab. III, Serm. 1, Cap. 45, p. 608, Ed. cited p. 644, *supra*—broth made from chickens and partridges (jusculà gallinarum et perdicum) declared to be excellent for those cancerous and malignant cases, (quæ cacoëthe Græci appellant,) which although they are generally incurable, nevertheless ought not to be left without succor. Here also I find a broth made by boiling chickens or partridges in barley or rice water until they fall to pieces, and astringent herbs added, commended for the diet of those whose dysentery results from poisonous drugs. ALEXANDER OF TRALLES—Lib. VIII, Cap. 3, p. 405, Ed. cited p. 624, *supra*—commends chicken broth in the alimentation of hepatic dysentery, but he cautions against using it to excess, especially if it is fatty or contains condiments. He also mentions—Cap. 8, p. 442—that some persons have recommended calves feet boiled down in ptisan to a thick jelly in the alimentation of ulcerative dysentery, but remarks that it should only be administered if the digestive powers are good, for it perturbs a weak stomach and makes the flux worse than before. It would appear from a passage in PAULUS ÆGINETA—T. III, p. 146, Transl. cited p. 624, *supra*—that broth made "from an old cock" was regarded as laxative; if made from a hen it was supposed to possess astringent properties. GALEN—*De Simpl. Med. Temp. ac Fac.*, Lib. III, Cap. 15, [Ed. Kühn, XI, p. 576,]—had previously declared that the broth of old cocks was laxative, while their flesh was astringent. I find also in AVICENNA—Lib. III, Fen 16, Tract. 1, Cap. 4, p. 818, Ed. cited p. 632, *supra*—a preparation recommended for the diet of dysenteries, made by boiling down flesh (*e. g.*, of young chickens) with rice and millet, straining it, concentrating the solution over the fire until it acquires a gelatinous consistence and adding astringent herbs.

† NICOLAUS PISO—Lib. III, Cap. 15, p. 274, *op. cit.*, p. 665, *supra*—permitted the gruels of rice, &c., administered to dysenterics to be prepared with the broth of a hen or young chickens, instead of with milk. A better appreciation of the value of this kind of food will be found in the treatise of FAB. HILDANUS—Cap. 7, p. 677, *op. cit.*, p. 644, *supra*: "In case the strength fails, consommé and other restoratives (may I thus translate consummata et restaurantia?) made of capons, veal and mutton, are highly advantageous and very nutritious. The flesh is boiled in water until it is wholly separated from the bone, and dissolved into particles, then it is strained through a linen cloth, and the fat skimmed off." He adds that when cold this gelatinizes and that it should be warmed for administration, and three or four spoonfuls given every four hours. But he is not content with the preparation made in this simple way, and must needs spoil it by the addition while cooking of bistort, tormentil, prepared coral, hartshorn and what not. He praises highly a restorative invented by QUERCETANUS, made by mincing a capon with one or two partridges and some mutton or veal, macerating twelve hours in white wine, then introducing the whole into a glass bottle, adding cinnamon, nutmeg, prepared pearls, coral, astringent flowers, &c., and, closing the mouth of the bottle, introducing it into a vessel full of water and boiling for seven or eight hours. The juice was then strained through a linen cloth, the fat skimmed off with a silver spoon and the resulting extract used as the simple preparation described above. Of course this precious extract (precium insolutum) is too costly for the poor, who can, however, cut up a capon with some mutton, put it with a little cinnamon into a glass bottle and boil it, which will yield an extract quite good enough for them. HILDANUS also mentions gelatin prepared by boiling calves' feet along with the meats named above as useful both in restoring the strength and constringing the flux; of course he must needs add to this, also, bistort, tormentil, hartshorn, &c. SENNERTUS—T. III, p. 184, *op. cit.*, p. 645, *supra*—directs that broths shall not be given unless they are endowed with astringent properties by the addition of suitable medicaments. They are then well fitted to support the failing strength. HOFFMANN—T. III, p. 156, *op. cit.*, p. 647, *supra*—also advises the addition of astringents to the broths administered to dysenterics.

‡ SAVIGNAC—p. 455, *op. cit.*, p. 630, *supra*. This view followed by BARRALLIER—p. 785, *op. cit.*, p. 603, *supra*.

§ See pp. 314, 456, 525 and 528, *supra*.

form so soon after the onset of an attack of acute dysentery as the patient can manage it. The idea, so strenuously insisted upon by Broussais* and his followers, that the inflammatory process in the intestine can be subdued by an antiphlogistic regimen is altogether erroneous. Unable to digest in the early stages of the disease, the patient soon falls into a condition in which lack of adequate nourishment aggravates, instead of subduing, the local disease, and a sustaining treatment becomes as indispensable as in other inflammatory processes.† Particularly in diphtheritic dysentery after sloughing has commenced are supporting measures urgently demanded.

*Broths and soups*, especially those made from chicken or beef, are suitable for administration as early in the course of an acute dysentery as the stomach will retain them. Chicken broth is perhaps earliest borne; that made from beef is the most nutritious; mutton broth holds an intermediate place in this respect, but its flavor is less generally acceptable.‡ When either of these broths is first administered the fat should be carefully removed by skimming; it should not be too highly seasoned, nor should it be thickened with flour. Later in the disease a moderate quantity of flour-thickening is not objectionable, and in chronic cases it is not necessary to skim off all the fat if the patient relishes the soup better with a little remaining. The question of the addition of vegetables will be referred to further on. Properly made beef broth or soup especially is quite nourishing, if the patient be able to retain and digest a sufficient quantity.§ In consequence of the practical difficulties in these two directions various endeavors have been made both to obtain greater concentration and to facilitate digestion.

Endeavors of the first kind have led to the invention of the several forms of *beef tea* and *beef essence*,‖ for the extemporaneous preparation of which various formulæ have been

* Broussais—T. III, p. 207 *et seq.*, *op. cit.*, p. 643, *supra*.

† Haspel—T. II, p. 142, *op. cit.*, p. 621, *supra*—has drawn a pitiful picture of the consequences of the antiphlogistic regimen as practiced by himself in the dysentery of Algeria on his first arrival in that country: "I kept my patients on a severe regimen, trying their digestive powers very gradually, (tâtonnant peu à peu les forces digestives,) always trembling lest premature alimentation should augment the disease. I prolonged their stay in hospital, and when at last, after a thousand accidents, they reached a tardy convalescence, they were œdematous, debilitated, cachectic, (cacochymes,) emaciated and liable to frequent relapses which often proved fatal."

‡ Of these Savignac—p. 456, *op. cit.*, p. 620, *supra*—gives the preference to beef, which is certainly the most nourishing. Compare the account of the various forms of broth (bouillon) by Fonssagrives—*Hygiène Alimentaire des Malades*, &c., 2me Éd., Paris, 1867, p. 126 *et seq.* He remarks: "Beef broth is the only one to which recourse is had when it is wished to give to the sick a reparative aliment; the broths of the white meats, on the contrary, are preferable when it is proposed to unite the benefits of a light aliment with those of a diluent and slightly laxative drink."

§ Magendie—*Rapport de la commission dite de la gélatine*, Comptes Rendus, T. XIII, A, 1841, p. 261—found that the bouillon used at the St. Louis hospital in Paris contained only from 11.8 to 17.1 grammes of dry residue per litre, of which from 4.76 to 9.86 grammes were saline matter. Even the carefully prepared bouillon of the Compagnie hollandaise—p. 263—only contained from 21.56 to 25.5 grammes of dry residue, of which from 7.28 to 9.98 were composed of salts. It cannot then be expected that any ordinary broth will contain more than 2 per cent. of organic matter. See, also, on the subject of these preparations E. Soubeiran—Art. *Bouillon*, in Dict. de Méd., 2me Éd., T. V, Paris, 1833, p. 514; J. Pereira—*A Treatise on Food and Diet.* Amer. reprint, New York, 1843, p. 196; and Z. Roussin—Art. *Bouillons*, in Nouv. Dict. de Méd. et de Chir., Pratiques, T. V, Paris, 1866, p. 442. The last cited author insists especially upon the precautions, first pointed out by Chevreul in a report to the Academy of Sciences, Jour. de Pharmacie, T. XXI, 1835, p. 237, that to make good broth the meat should be put into cold water and gradually raised to the boiling point, at which it is to be maintained for some time. While, on the other hand, if the meat when boiled is to be eaten instead of the soup, it should be introduced at once into water already boiling. According to Fonssagrives—p. 119, *op. cit.*, *supra*—550 grammes of beef should be allowed to each litre of water to make a really good broth, which will have a specific gravity of about 1015. F. W. Pavy—*A Treatise on Food and Dietetics*, London, 1874, p. 474—remarks on the preparations of broths and soups: "To accomplish what is aimed at in the most complete manner the meat should be chopped or broken into fine pieces, and placed in cold water. After being allowed to macerate a short time, for the soluble constituents to become dissolved out, it is gradually heated to a point which should vary according to the product required. In the case of broths and beef tea, which properly contain only the flavoring principle of meat—*osmazome*—and the soluble constituents, with finely coagulated albuminous matter, all that is required is to produce gentle simmering, and this should be kept up for about half an hour. In the case of soups a prolonged gentle boiling is required, in order that the gelatine may be extracted, this being the principle which gives to good soup its property of solidifying on cooling. Bones require boiling a longer time than meat. The chief principle they yield is gelatine, and its extraction is greatly facilitated by the bones being broken into fine fragments previous to being used."

‖ Beef tea is named already among the aliments suitable for dysenteries by Macbride (1772)—Part II, Book III, Chap. 3, p. 468, *op. cit.*, p. 664, *supra*. As at present understood, it is simply a strong beef broth so made as to extract as little gelatin as possible from the meat. This precaution was not formerly considered desirable. On the contrary the reader must have observed how carefully prolonged boiling was directed in the receipts for preparing concentrated broths cited from Fabricius Hildanus in note †, last page. In the same spirit Udalricus Reydt—*Diss. de jure esculento*, Basel, 1718, p. 9—declared that the gelatinous broths (jusculs gelatina) are deservedly called "jus coosumatum." Accordingly, until quite recently, beef tea was boiled for some time, and, I may add, usually made with more water to a given weight of meat than is now thought best. In illustration I may cite the receipt of Kitchiner—*The Invalid's Oracle*, (from the 6th London Ed.,) New York, 1831, p. 80—which directs a pound of lean beef to be cut into thin slices, put into a quart and half a pint of cold water, and gradually warmed until "the scum rises." This is to be removed, the saucepan covered and boiling continued "for about two hours," after which "skim the fat off, strain it through a sieve or napkin, skim it again, let it stand ten minutes to

published; while under the name of *extract of beef* a variety of manufactured articles, claimed to represent the alimentary principles of meat in a concentrated form, have of late been thrown upon the market.* These latter preparations, which it is asserted have the further advantages for the military medical service of keeping for a considerable time, of being readily transported and of saving the labor of extemporaneous preparation, have been made the subject of numerous investigations, and sharp controversies have arisen as to their mode of action and nutritive value.

Chemical analysis has shown that even extracts prepared after the process devised by Liebig, and these are as a rule the best in the market, contain only from six to ten per cent. of nitrogen, and this chiefly in the form of creatin, creatinin and extractives.† If

settle, and then pour off the clear tea." The receipt given by THACHER—*American Modern Practice*, New Ed., Boston, 1826, p. 777—which has had considerable vogue in America, is made with a pound of beef to the quart of water and boiled twenty minutes. But almost all the modern receipts for the extemporaneous preparation of beef tea are based upon the formula for "flesh broth" (Fleischbrühe) devised by LIEBIG—*Ueber die Bestandtheile der Flüssigkeiten des Fleisches*, Annalen der Chemie und Pharmacie, Bd. LXII, 1847, S. 360—in which equal parts of meat and water are used, and prolonged boiling carefully avoided. He directs a pound of lean beef, free from fat and bone, to be finely hashed and mixed with an equal weight of cold water, then slowly heated and very gradually brought to a boil. After boiling a few minutes only the fluid is to be strained off through a napkin, and by firm squeezing the whole expressed. It may be colored with caramel and flavored with salt and other condiments to taste. LIEBIG declared that thus prepared, the broth contains more nutritive matter than if the boiling be prolonged. Some of the writers who with various modifications have repeated this formula boil about the same time, *e. g.*, FONSSAGRIVES—p. 126, *op. cit.*, *supra*—who recommends two minutes; while others have returned to the old habit of protracting the ebullition, *e. g.*, SAVIGNAC—p. 461, *op. cit.*, p. 620, *supra*—who boils half an hour, and PAVY—p. 511, *op. cit.*, *supra*—who boils an hour. SAVIGNAC—*loc. cit.*—indeed, thinks this broth too strong for many cases, in which twice the quantity of water may be used. A few years after the publication of the paper just cited, LIEBIG—*Eine neue Fleischbrühe für Kranke*, Annalen der Chem. und Pharm., Bd., XCI, 1854, S. 241—suggested a new form of beef tea, which he called "cold meat extract," (Kaltes Fleischextract,) but which has very generally been spoken of as his "fortifying broth," (bouillon fortifiant,) or as "Liebig beef tea." Half a pound of the flesh of a recently killed ox minced fine is mixed with ½ pounds of distilled water. To this is added four drops of pure muriatic acid and half a drachm to a drachm of common salt. After standing an hour the mixture is thrown on a hair sieve and the fluid drained off without pressure. The turbid fluid that first passes through is returned to the sieve, and this is repeated until it comes through quite clear; half a pound more of distilled water is then poured on, a little at a time. Altogether about a pound of fluid is thus obtained from half a pound of meat. The fluid has a bloody color which disgusts some patients, but which, as DEBOUT—*Sur la préparation d'un bouillon fortifiant*, Bull. Gén. de Thér. Méd. et Chir., T. XLVII, 1854, p. 572—has suggested, is readily concealed by the addition of a little caramel. According to LIEBIG—*loc. cit.*—this cold extract may be given cold, a cupful at a time. It ought not to be heated, because this precipitates the albuminous matter it contains, and in summer it should be kept in a cold place, and only a little made at a time because it putrefies very readily. Still another mode of preparing beef tea is attributed by THACHER—*loc. cit.*, *supra*—to RUSH: "Cut a pound of beef, first deprived of its fat, into small pieces so as to be put into a quart bottle. The bottle well corked, without the addition of water, should be put into a small pot of cold water, which should be boiled for three or four hours. The liquor should then be poured out of the bottle and made savory with a little salt and any agreeable spice." The authority of RUSH gave this preparation great popularity in Philadelphia, where it was long annually commended by my venerable preceptor, Dr. GEORGE B. WOOD; see his *Treatise on the Practice of Medicine*, 4th Ed., Philadelphia, 1866, Vol. I, p. 395—where he declares that this preparation "in the quantity of from a teaspoonful to a tablespoonful, repeated at intervals of half an hour, an hour, or two hours, aids greatly in the support of the system" in typhoid fever and other low states of disease.

* I will not even attempt to name the various forms of concentrated beef extract with which the market has been flooded. The best are made by the process devised by LIEBIG and described in the first of his papers cited in the last note, S. 360. It is made by a prolonged evaporation over a water bath at a moderate temperature of the flesh broth described in the same essay. Thirty-two pounds of beef thus treated yield a pound of a soft dark-brown mass which LIEBIG called meat extract, (Fleischextract,) and subsequently—*Extractum carnis*, Annalen der Chemie und Pharmacie Bd. CXXXIII, 1865, S. 125—authorized GIEBERT, who manufactured it on a large scale in Uruguay, to call it "*Liebig's Extractum Carnis.*" According to LIEBIG, half an ounce of this extract, with the addition of a little salt, is sufficient to convert a pound of water into an agreeable and nutritive beef tea. During our civil war a variety of beef extracts were purchased by the Medical Purveying Department of the Army; the total quantity, according to an examination of the accounts of the Purveying Department by Surgeon W. C. SPENCER, U. S. A., amounting to 570,980 pounds. A portion of this supply was quite liquid, and although put up in tin cans a good deal of it soon spoiled, so that it early lost popularity. Most of the more solid extracts subsequently purchased contained a considerable quantity of gelatin, as was ascertained by analyses at the laboratory of the Surgeon General's Office. Beef extract made on LIEBIG'S plan was not, so far as I know, an article of commerce in this country until after the civil war.

† According to LIEBIG—*Ueber den angeblichen Kochsalzgehalt des Extractum Carnis Americanum*, Annalen der Chemie und Pharmacie, Bd. CXL, 1866, S. 249—meat extract prepared by his method ought to contain from 16 to 21 per cent. of water, 18 to 22 of ash and 50 to 60 of extractive soluble in alcohol of 80 per cent. It ought to contain *no* gelatin, which LIEBIG designates the true enemy of good beef extract. KEMMERICH—*Ueber die Wirkungen, den Ernährungswerth und die Verwendung des Fleischextracts*, Deutsche Klinik, Bd. XXII, 1870, S. 152—gives the following analysis of LIEBIG'S extract: Water 16 per cent., ash 18 to 20.1, extractives, soluble in alcohol of 80 per cent., 81.5, (?,) nitrogen 9.51. PARKES—p. 274, *op. cit.*, p. 599, *supra*—analyzed five samples of LIEBIG'S extract, some of them from Australia and South America. The average amount of water was 16 per cent., of ash 20, of nitrogen 8 per cent., (the lowest being 6.6, the highest 10.14;) he also found a notable quantity of free and combined lactic acid. If with H. LETHEBY—*On Food*, 2d Ed., Amer. reprint, New York, 1872, p. 111—we adopt the conclusions of EDWARD SMITH, "that even in periods of idleness a man's daily food should contain not less than 4,300 grains of carbon, with 200 of nitrogen," it will be seen that it would take a considerable quantity of beef extract to supply the necessary nitrogen, supposing the whole of that contained in the extract could be utilized. With regard to the inorganic salts contained in LIEBIG'S extract, PARKES—*The action of extractum carnis*, Army Med. Dept. Report, Vol. IX, 1867, Appendix, p. 253—estimates the potash salts, chiefly chloride and phosphate, at 66 grains per ounce; this is on the supposition that they amount to "20 per cent. of the soluble salts (which is really too high for the commercial article.)" According to W. BOGOSSLOWSKY—*Phys. Studien über die Wirkung der Fleischbrühe, des Fleischextractes, der Kalisalze und des Kreatinins*, Archiv für Anat. Phys. und Wiss. Med., 1872, S. 351—LIEBIG'S extract contains 22.7 per cent. of ash, of which 21.5 is soluble and 1.1 insoluble. The soluble salts consist almost entirely of phosphate and chloride of potassium. The same investigator found in this extract 2.726 per cent. of creatinin, (mean of 6 analyses, S. 422.) For several analyses of commercial extracts of meat and a brief account of the Russian Tablettes de Bouillon, see LETHEBY—*op. cit.*, *supra*, p. 173 *et seq.* I may mention in this place that the late Dr. B. F. CRAIG formerly chemist of the Surgeon General's Office at Washington, wrote an ingenious report (Dec. 11, 1869) on the analysis of beef extracts, in which he proposed to determine their comparative value by dialysis. He took the ground that these preparations contain: "Firstly, the real piece of meat, or the soluble matter contained in muscular fibre; and secondly, the products of the transformation of animal tissues by the action of hot water. The first group of substances may in a general way be classified as follows: a. Soluble protein compounds, as albumen and casein. b. Nitrogenous organic bases, creatine, creatinine,

by a stretch of the imagination we could suppose the whole of this nitrogen to represent assimilable nitrogenous matter, the percentage contained in a beef tea made by mixing an ounce of the extract with a pound of water as originally directed by Liebig would be exceedingly small. Accordingly it is by no means wonderful that some have altogether denied that beef extract possesses any nutritive value.* Others, while denying that it can act as ordinary food, have assigned to it properties resembling those of coffee and tea, or at least a gentle stimulating action upon the heart and nervous system; and these effects have been supposed by some to be due to the soluble potash salts contained in the extract; by others to the so-called extractive matters, and particularly to the creatinin.† Yet another view is that, administered in moderate and repeated doses, the extract favors the digestion of other food, whether vegetable or animal, increasing in this way the nutritive value of a small quantity of ordinary food by securing its thorough assimilation. For this reason it is claimed to be especially useful to feeble individuals, convalescents and those suffering from the immediate consequences of grave injuries.‡

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and sarcine. e. Nitrogenous organic acids, inosic, inosinic, etc. d. Non-nitrogenous organic acids as lactic and others. e. Inosite and other neutral organic compounds. f. Mineral substances, chiefly chlorides and phosphates." CRAIG attempted to separate these dialyzable substances from the gelatinous matters present by dialysis, and, determining the inorganic salts and water in the usual way, supposed he had thus a fair measure of the really useful part of the extract. He thus obtained from a sample of LIEBIG'S extractum carnis manufactured in South America: Moisture 18.6 per cent., dialyzable matter 54, inorganic salts 22.6. From one manufactured in Texas: Moisture 23.6 per cent., dialyzable matter 52.33, inorganic salts 21.

* Without attempting to give a list of those who have taken this view, I may refer to the experiments of E. KEMMERICH—*Unters. über die phys. Wirkung der Fleischbrühe, des Fleischextracts und der Kalisalze des Fleisches*, Archiv für die Gesammte Physiologie, Jahrg. II, 1869, S. 85—who concludes: "Dass der Liebig'sche Fleischextract für sich allein kein Nahrungsmittel ist." He fed two dogs, 8 weeks old, the one on water alone, the other, besides water, received 5 grammes of LIEBIG'S flesh extract daily. At the end of 5 days the dog fed on the extract had lost more weight than the one fed on water only. The dogs were then fed for 16 days on milk and raw flesh, and when in good condition the experiment was commenced anew. This time the dogs were fed as before, but the experiment was prolonged; on the 12th day the dog fed on flesh extract died, the other, though emaciated and feeble, could still stand and walk, and on receiving good food soon recovered. This result was the more striking, because the heaviest, presumably the strongest of the two pups, had been selected to receive the beef extract. KEMMERICH attempts to explain it by supposing the stimulating action on the heart of the potash salts contained in the flesh extract had rendered the processes of tissue-metamorphosis more active than they would otherwise have been. So, too, HÖRSCHELMANN—*Verhandl. des allg. Vereins St. Petersburger Aerzte*, St. Petersburger Med. Zeitschr., N. F., Bd. I, 1870, S. 369—from experiments on convalescent soldiers, concluded, "das Extract ist als Surrogat für Fleisch *nicht* anzusehen." Still more strongly has a similar opinion been expressed by GUSTAV BUNGE—*Ueber die physiologische Wirkung der Fleischbrühe und der Kalisalze*, Archiv für die Gesammte Physiologie, Jahrg. IV, 1871, S. 277 *et seq.*—who seems to attribute the supposed nourishing action of beef extract merely to its agreeable flavor and the hot water in which it is given, comparing its effects upon the sick to that of a fragrant flower, the sight of Raphael's Madonna or hearing a symphony of Beethoven. So, also, P. MÜLLER—*Extracts of meat considered in a physiological point of view*—Moniteur Scientifique, Sept. 1 and 15, 1871; which I have not seen, and cite The Chemical News, Vol. XXIV, 1871, p. 205—concludes from his researches: "Meat extracts are neither directly nor indirectly food, for they do not contain albuminoid matter, neither do the nitrogenous principles which they contain arrest dis-assimilation."

† That the juices of flesh possessed these stimulating properties seemed to be proven by the experiments of J. RANKE—*Tetanus*, Leipsic, 1865, S. 339 *et seq.* KEMMERICH—S. 49 *et seq.*, *op. cit.*, last note—maintained that these properties were due to the potash salts contained in the extracts of flesh: see also his first paper on this subject—*Unters. über die phys. Wirkung der Fleischbrühe*, Archiv für die Gesammte Physiologie, Jahrg. I, 1868, S. 120—and his article in the Deutsche Klinik cited in note †, last page. In this latter article I find the following expression—S. 153: "Das Fleischextract ist zunächst durch die Anregung der Herzthätigkeit und die Beschleunigung des Blutkreislaufes ein vorzügliches Belebungs-und Stärkungsmittel, ähnlich wie Kaffee, Thee und die Gruppe der Alcoholica. Es unterscheidet sich aber von ihnen wesentlich durch seinen unmittelbar günstigen Einfluss auf die Ernährungsprocesse des Körpers." MAYER—*De la valeur nutritive et médicale de l'extrait de viande*, Annales de la Soc. de Méd. d' Anvers, An XXXI, 1870, p. 470—from a partial repetition of the experiments of KEMMERICH, was led to adopt his conclusions in this and other particulars; and the observations made by HÖRSCHELMANN—*loc. cit.*, last note—on convalescent soldiers, induced him to accept the same views. On the other hand, W. BOGOSSLOWSKY—S. 403, *op. cit.*, note †, last page—concluded from an elaborate series of experiments that the stimulating action of LIEBIG'S extract is due not merely to the potash salts, but chiefly to the creatinin, of which, as we have seen, he found on an average 2.7 + per cent. But any action resembling that of tea or coffee is strenuously denied by other experimenters, *e. g.*, by BUNGE—S. 282, *op. cit.*, last note—who concludes from his investigations: "So muss ich doch die weiter gehende Annahme, welche die Extractivestoffe des Fleisches dem Kaffee, Thee, Alkohol etc. als gleich werthvolles Genussmittel zur Seite stellt, als eine vorläufig noch völlig unbegründete bezeichnen."

‡ Even LIEBIG—*Ueber den Werth des Fleischextractes für Haushaltungen*, Annalen der Chemie und Pharmacie, Bd. CXLVI, 1868, S. 138—appears to claim still more than this, when he remarks that "it may be proved with tolerable certainty that the ingredients of broth which are contained in meat extract increase the nutritive value of bread, so that the two together constitute a more perfect nutriment than bread alone. And that in cases where time for cooking is not allowed, [as often happens with troops in the field,] the meat extract with bread is the only substitute for food we possess, needs no further proof." He goes on to cite certain experiments of PETTENKOFER and VOIT to show that in the case of troops in the field deprived of all other nourishment, meat extract is a most precious means to make hunger less unbearable and to keep the men capable of marching. In these experiments—*Unters. über den Stoffverbrauch des normalen Menschen*, Zeitschr. für Biologie, Bd. II, 1866, S. 478, *et seq.*, Versuch I–III—a robust man received on one occasion for 24 hours, on another for 36, besides water, no other food than a little beef extract and salt: 12.5 grains extract, 15.1 grains salt on the first occasion; 13.8 grains extract, 13.2 grains of salt on the second. LIEBIG correctly cites them as remarking: "Das Befinden während der 36 stündigen Nahrungsentziehung war ein völlig normales und es hätte wohl, nach der Versicherung des Hungernden, ein noch längeres Fasten ertragen werden können." Nevertheless the whole tenor of the essay shows that the writers regarded the subject of these experiments as practically receiving no nourishment; that is, in a condition of "Nahrungsentziehung." KEMMERICH—*loc. cit.*, last note—maintained that the potash salts of the extract not merely acted in a similar way to coffee and tea, but exercised a favorable effect in the nutrition of the body. In favor of this view he brings forward the following experiment—S. 151, *op. cit.*: He fed two young dogs of the same age each with the same insufficient amount of food, to which he added for one dog a quantity (not specified) of the mineral ingredients of flesh extract, for the other a corresponding quantity of common salt. The latter at the end of six weeks was so emaciated and feeble that he seemed about to perish, while the dog which received the extract salts was active and well nourished. He now substituted the extract salts for the common salt in the diet of the other dog, without changing it in any other particular, and it speedily recovered

Not merely has the nutritive value of beef extract been questioned, but it has been declared that in overdoses it exercises a poisonous influence, and that its liberal administration, especially to feeble individuals, is liable to produce injurious effects even when it does not amount to actual poisoning. This view was first advanced by Kemmerich,* as a deduction from his experiments on rabbits. He maintained that the soluble potash salts in the extract are the active agents, and that in small doses they stimulate, while in large quantities they paralyze the action of the heart. Bunge,† on the other hand, having repeated these experiments, came to the conclusion that even in the case of rabbits the poisonous properties of the extract had been very greatly exaggerated, and that it would require a larger quantity than the stomach could possibly retain to produce similar effects on the human subject. Bogosslowsky,‡ who admits the poisonous effects of large doses of the extract on rabbits and its injurious action on man, regards these results as due to the action of the creatinin contained in the extract even more than to the potash salts.

The injurious effects of the administration of too much beef extract to feeble individuals are manifested, according to Kemmerich,§ by palpitations of the heart and diarrhœa. From the same cause Bogosslowsky‖ observed symptoms of gastro-intestinal catarrh, a sense of uneasiness and oppression in the gastric region, increased secretion of saliva, thirst, loss of appetite, rumbling in the bowels and diarrhœa, together with debility and more or less headache. According to Parkes,¶ in very large doses the extract, like large quantities of meat, sometimes causes heaviness and torpor. Nor in the use of the commercial extract should the injurious effects be overlooked which are likely to result, if from any cause incipient putrefaction has commenced in it; the diarrhœa often observed to follow its use is perhaps not unfrequently due to this cause. These considerations are sufficient to show how unwise it would be to rely too exclusively upon commercial extract of beef in nourishing dysenteric patients. Where beef tea can conveniently be prepared extemporaneously, I am disposed to give it the preference, but would only use either in addition to other nutritive substances, and not to their exclusion. Chemical analysis, physiological experi-

his health and flesh. MAYER—p. 469, *op. cit.*, last note—claims to have repeated these experiments with identical results, and agrees with KEMMERICH that the addition of meat extract to other albuminous food is especially advantageous to the nutrition of those convalescing from wasting diseases. The experiments of HÖRSCHELMANN—*loc. cit.*, last page—seem to confirm these views, and even to show that a smaller meat ration is sufficient to nourish a person who receives meat extract than is required by one who does not. PARKES—p. 251, *op. cit.*, p. 599, *supra*—remarks of the physiological effects of LIEBIG'S extract: "By some its action has been compared to that of tea and coffee, but there does not appear to be any close parallel. By supplying lactic acid and flavoring matters and potash salts, it must aid nutrition, even if we suppose that the nitrogenous principles are useless, which cannot be considered as yet proved." He adds in a note: "Two gentlemen at my request lived for four days on Liebig's extract and bread. One lost weight, but was otherwise healthy; the other became indisposed and gained weight, as if excretion were interfered with. These symptoms were at once removed by the addition of fats and starches to the same diet." PARKES further declares—*loc. cit.*—that LIEBIG'S extract, mixed with wine, "has been employed with great success in rousing men in collapse from wounds." W. A. HAMMOND—*A Treatise on Hygiene*, Philadelphia, 1863, p. 514—declared, during the progress of the civil war, "the importance of extract of beef to armies can scarcely be overestimated. Hundreds of lives have been saved by it on the battle-fields of the present war." General statements of this kind, however, decide nothing as to the nutritive value of beef extract, for under such circumstances it is almost always administered together with wine or spirits, especially during our war with whiskey, and generally soon followed by other food, so that its real effect could only be conjectured.

* KEMMERICH—Papers cited pp. 671 and 672, *supra*.

† BUNGE—S. 477, *op. cit.*, last page—found that a rabbit weighing a kilogram requires about three grammes of potash salts administered by the stomach to kill it. If the poisoning of larger animals were proportional to their weights, a man weighing 75 kilograms would require 225 grammes of potash salts to produce death by heart paralysis. Now experiment shows that large animals are poisoned by proportionally smaller doses than small ones; yet if we assume 50 grammes only of potash salts to be poisonous to a man, death from this cause is quite impossible, because experience shows that the human stomach at once relieves itself of such a great quantity of these salts by vomiting. I may add that PARKES—*loc. cit.*, *supra*—has singularly misunderstood this passage.

‡ BOGOSSLOWSKY—S. 428, *op. cit.*, p. 671, *supra*—concludes: "Der Tod, nach der Einführung von concentrirter Fleischbrühe bei Kaninchen, ist durch die Herzparalyze bedingt, welche durch die Gesammtwirkung der Kalisalze und des Kreatinins herbeigeführt wird." He tried a number of experiments on medical students, intended to show that the action of the extract on man is largely due to the creatinin. A student who took 15 grammes of the extract experienced next day slight catarrh of the stomach with loss of appetite. A dose of 20 grammes produced still more marked disturbance. 30 grammes still more, and the administration of 40 grammes was followed by headache, thirst, loss of appetite and severe diarrhœa. S. 385 *et seq.*

§ KEMMERICH—Deutsche Klinik, 1870, S. 142, cited p. 671, *supra*. ‖ BOGOSSLOWSKY—S. 384, *op. cit.*, p. 671, *supra*.

¶ PARKES—*loc. cit.*, *supra*. In the article on *The action of extractum carnis*, cited p. 671, *supra*, he remarks also: "There is no doubt that when given to sick, and even to healthy persons in very large quantities, the *extractum carnis* does sometimes produce a degree of malaise and, possibly, feverish symptoms," p. 259.

ments and clinical experience combine to show that neither beef tea nor meat extract is the nutritive equivalent of the quantity of meat from which it is made. It may be conceded that both exert a feeble stimulating action, that they favor to some degree the digestive functions, and that they possess slight nutritive properties; but as yet the more thoroughly each of these effects has been investigated the more trifling it appears to be.

Nor can it be regarded as at all settled that the advice of Liebig was wise when he counseled a mode of preparation by which the gelatinous products of the meat should be excluded. It is true that the report of the so called Gelatin Commission of the French Academy, drawn up by Magendie,* threw grave doubts on the nutritive value of these products; and Vrolik's report of the Commission subsequently appointed by the Netherlands Institute† went still further in this direction. But Boussingault found that when gelatin was administered to ducks a considerable portion was absorbed and only a part found its way into the stools. This result was confirmed by the observations of Frerichs on dogs. Moreover, both he and Bischoff found that the administration of gelatin was followed by a marked increase in the quantity of urea excreted.‡ Carl Voit§ has recently made an elaborate experimental investigation of this subject, from which he concludes that, while it has not been shown that gelatin acts as plastic food in the repair of the tissues, yet on account of the readiness with which it breaks up into urea and other products after it has been absorbed into the circulation, it plays a part not unlike that of the fats and other non-nitrogenous bodies, but in a much higher degree.

Accordingly it is not surprising that so careful a writer as Pavy‖ should declare that, although the precise capacity of gelatin as an agent of nutrition is uncertain, there can be no doubt that it behaves like a protein compound in relation to force-production. In fact the cooks of the present day continue to make consommé from beef, much as was done before the days of the Gelatin Commission, by protracting the boiling until the resulting fluid is quite rich in gelatin. It seems by no means certain that this preparation is not really of greater value in the nourishment of the sick than the forms of beef tea from which all gelatin has been rigorously excluded. Since the publication of the researches of

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* MAGENDIE—p. 237 *et seq.*, *op. cit.*, p. 670, *supra*. The question this commission undertook to investigate was, "Is it possible economically to extract from bones an aliment which alone or mixed with other substances can take the place of meat?"—p. 239. After a series of researches which lasted nearly ten years the commission concluded—see p. 282—that this question must be answered in the negative; that neither gelatin, albumen nor fibrin, taken alone, nourish animals except for a very limited time and in a very incomplete manner. Nevertheless the commission formally declined to express an opinion as to whether gelatin, when associated with other nutritious substances, has any influence upon the nourishment of man.

† *Extrait du Rapport de la première classe de l'Institut royal des Pays-Bas, sur les qualités nutritives de la gélatine*, traduit et communiqué par M. Vrolik, Comptes Rendus, T. XVIII, 1844, p. 423.

‡ BOUSSINGAULT—*Expériences statiques sur la digestion*, Ann. de Chimie et de Physique, 3me série, T. XVIII, 1846, p. 469 *et seq.*—gave a fasting duck 60 grammes of dry gelatin between 8 A. M., and 1 P. M. At 5 P. M. the duck was killed and the intestinal contents as well as the dejections during the period named analyzed: 27.73 grammes only of gelatin were recovered, showing that 32.27 grammes had been absorbed. In a second experiment, the same quantity having been given to another duck at the same hours, the examination showed the absorption of 38.28 grammes. FRERICHS—Bd. III, Abth. 1, S. 682 *et seq.*, *op. cit.*, p. 375, *supra*—gives a brief account of the previous investigations as to the nutritive value of gelatin, and remarks: "The circumstance that the gelatin ingested is never again excreted as such, speaks against the opinion of the French physiologists, who think to have proven its complete uselessness. It must suffer certain metamorphoses during its stay in the organism which cannot be indifferent for the transformation of the tissues, (Stoffwandel,) and which alone can lead to a conclusion as to its nutritive value. After large doses of gelatin, I constantly saw the urine become highly concentrated; its specific gravity rose from 1018 to 1030–34. I sought for leucin and glucin, but could not discover them. On the other hand, the urea was strikingly increased. Gelatin, therefore, suffers the same transformation as the superfluous proteine substances; it surrenders the greater part of its carbon and hydrogen for the purpose of respiration, while its nitrogen is excreted in the form of urea." BISCHOFF—*Der Harnstoff als Maass des Stoffwechsels*, 1853, S. 70; BISCHOFF u. VOIT—*Die Gesetze d. Ernährung des Fleischfressers*, 1860; I cite these two papers from CARL VOIT—S. 311 u. 312, *op. cit.*, *infra*.

§ CARL VOIT—*Ueber die Bedeutung des Leimes bei der Ernährung*, Zeitschr. für Biologie, Bd. VIII, 1872, S. 297. A careful paper, in which the reader will find a good abstract of the history of this question. The author concludes: "On account of the readiness with which it breaks up, it can decompose instead of the circulating albumen, and thus spares this, and also limits the destructive metamorphosis of the albumen of the tissues. From this point of view it produces results similar to those of the fats or carbo-hydrates, only it acts in a much higher degree, exactly like the peptones, which are incapable of being transformed in the body into albumen again," S. 387.

‖ F. W. PAVY—p. 77 *et seq.*, and p. 288 *et seq.*, *op. cit.*, p. 670, *supra*. The opinion cited in the text will be found on p. 79. So also H. LETHEBY—p. 173, *op. cit.*, p. 671, *supra*—remarks: "Possibly it may serve in the direct nutrition of gelatinous tissue, or, by becoming oxydized, it may develope force; for it appears to be transformed, like albumen and fibrin, into urea, and so leaves the system."

Voit, indeed, Uffelmann* has again revived the use of gelatinous broths in the treatment of dysentery, and asserts that he has derived great advantage from them. I see no reason to doubt the correctness of his observations.

With a view to facilitating the digestion of nitrogenous aliments in conditions of apepsia the administration of *pepsin* has been proposed, and has found extensive use with apparent success in chronic dyspeptic conditions of various kinds. Corvisart has suggested its employment in those diarrhœas which appear to result from defective stomach digestion, and some success in this direction is reported to have been obtained with adults by Ballard, and by Barthez with children.† But the observations of this kind are not as yet sufficiently numerous to determine the real usefulness of pepsin in the treatment of fluxes.‡

It has also been suggested that nitrogenous aliment may be treated, out of the body, with a solution of pepsin and muriatic acid at a suitable temperature, and the *peptones* resulting from this artificial digestion administered as a soluble form of aliment quite ready for absorption.§ Leube, who has given this method some trial, states that the technical difficulties in the way of the successful preparation of peptones for use as food are very great, and that the solution, made in the manner indicated, smells so much like vomit that it is difficult to induce patients to swallow it. He claims, however, to have devised, with

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* UFFELMANN—S. 245, *op. cit.*, p. 288, *supra*—urges the use of these gelatinous broths (leimhaltige Suppen) on account of their freedom from injurious effects, the readiness with which they are assimilated, and the probability of the correctness of the conclusion of VOIT that they economize the oxidation of the albumen of the blood. He refers also to the successful use of gelatin in the diet of fever patients by H. SENATOR—*Untersuchungen über den Fieberhaften Process und seine Behandlung*, Berlin, 1873, S. 184 *et seq.*—who, likewise incited by the experiments of VOIT, has given gelatin as nourishment in various fevers, typhoid, scarlet fever, measles, &c., sometimes even to the extent of 80 grammes and more a day to an adult and declares not merely that it was valuable as a nutrient in connection with other aliments, but that so far from producing diarrhœa, or aggravating it, if present, it restrained the bowels.

† LUCIEN CORVISART—*Études sur les aliments et les nutriments; nouvelle méthode pour le traitement des malades dont l'estomac ne digère pas*, read before the Acad. de Méd., Dec. 27, 1853, Archives Gén. de Méd., série V, T. III, 1854, p. 298. In this essay occurs the following passage: "*Diarrhée.* Elle est souvent provoquée par le passage, dans l'intestin, d'aliments non digérés, à cause du défaut de sécrétion. Alors il faut employer ma méthode," p. 240. The method is, of course, to give pepsin. It was at CORVISART'S suggestion that BOUDAULT undertook the manufacture of pepsin preparations, which he described in a *Mémoire sur le principe digestif*, &c., read before the Acad. de Méd., Feb. 14, 1854, Bull. de l'Acad. Imp. de Méd., T. XIX 1853–4, p. 382. A year later he published a pamphlet on the same subject, of which I have only seen the English translation, viz: *On Pepsine*, translated by W. S. SQUIRE, 3d Ed., London, 1863; appended to which I note a letter from EDWARD BALLARD praising the use of pepsin in cases of diarrhœa and lientery arising from a defective secretion of gastric juice. See also BALLARD'S pamphlet *On artificial digestion*, London, 1857, and the essay of CORVISART—*De l'emploi des poudres nutrimentives (pepsine acidifiée)*, Bull. Gén. de Thérapeutique, T. XLVII, 1854, p. 320. The observations of BARTHEZ will be found in an article entitled *Bons effets de la pepsine dans la diarrhée des jeunes enfants*, same Jour., T. XLIX, 1855, p. 513. A summary account of the early history of the use of the gastric juice in medicine will be found in Lecture 40, On Pepsine, by THOMAS KING CHAMBERS; *The Renewal of Life*, Amer. reprint of 3d London Ed., Philadelphia, 1865, p. 589 *et seq.*; and an account of the introduction of pepsin into therapeutics, by CORVISART, is appended to SQUIRE'S translation of BOUDAULT'S pamphlet cited above.

‡ In our own country a serious obstacle to the employment of this remedy results from the circumstance that so much of the pepsin in the market is quite inert, either on account of defective methods of preparation or the changes this substance is so prone to undergo if kept. Acting Assistant Surgeon W. M. MEW reports that during the last few years he has found most of the samples of pepsin offered for sale to the Purveying Department, and examined in the laboratory of the Surgeon General's Office, to be quite inert. On one occasion thirteen samples were offered, of which but a single one possessed any activity. The method of examination was to attempt with proper precautions the artificial digestion of boiled white of egg with each preparation submitted. A recent article by OSCAR LIEBREICH—*The uses of pepsin in medicine, and its preparation*, The Practitioner, Vol. XVIII, 1877, p. 165—makes a similar statement as to the quality of the commercial pepsin of Europe: "But these preparations are very far from stable or reliable, and however active some of them may be when perfectly fresh, they do not remain active, and a large part of the pepsin powders prescribed are absolutely inert." On this statement the Editor of New Remedies, Vol. VI, 1877, p. 111, comments that "however true Professor Liebreich's remarks may be regarding the quality of preparations offered for sale in the German market, they will not hold good on this side of the water. The dry preparations have, we believe, been the ones most largely employed in this country, [*i. e.*, the United States,] and we are not aware that, after several years of trial, their effects have led to want of confidence among those who are capable of being judges." This extract serves only as an illustration of the loose manner in which opinions as to the therapeutic action of medicinal preparations are sometimes formed in America, for the experiments of MEW, to which I may add the clinical observations of H. C. WOOD—*A Treatise on Therapeutics*, 2d Ed., Philadelphia, 1876, p. 579—show that the opinion of LIEBREICH is fully applicable to the preparations sold under the name of pepsin in the United States. I may add that LIEBREICH has suggested solution in glycerine as the best method for the preservation of pepsin originally good.

§ On the artificial preparations of peptones, whether by means of pepsin or pancreatin and their properties, see the paper of G. MEISSNER—*Unters. über die Verdauung der Eiweisskörper*, Zeitschr. f. Rat. Med., 3te Reihe, Bd. VII, 1859, S. 1 *et seq.*—in an appendix to which the therapeutic use of the peptones, both by the mouth and rectum, is suggested. VOIT und BAUER—*Ueber die Aufsaugung im Dick- und Dünndarme*, Zeitschr. für Biologie, Bd. V, 1869, S. 550—gave the latter suggestion experimental trial, injecting a peptone solution into the rectum of a dog, and observed considerable increase in the urea secretion the following day. The use of peptones by the mouth as a means of supplying nitrogenous nourishment in cases of apepsia is discussed by LEUBE and UFFELMANN—*vide infra*—and as late as December, 1877, I find in the Protokoll of the Vereins der Aerzte in Berlin—see the Pharmaceutische Zeitung, Jahrg. XXII, 1877, S. 870—a communication by HOHL, entitled *Ueber Anwendung und Bereitung von Pept. sic. pulverat. Pept. syrup. aromat. und reines Pepton nach Dr. Adamkiewicz*, which shows that experiments in this direction are still progressing. The method employed to make pure peptone consisted in acting on washed blood-fibrin by muriatic acid and pepsin, precipitating the parapeptone by sodium carbonate, filtering, and concentrating by evaporation at a temperature not exceeding 70° Cent. It is claimed that 16 grammes of this peptone is equal in nutritive value to 20 grammes of meat. An abstract of this paper will be found in New Remedies, Vol. VII, 1878, p. 46.

the coöperation of J. Rosenthal, a mode of preparing peptones without the use of pepsin by the action of acid on meat in closed vessels at a high temperature, and has thus produced an emulsion, sold in Germany under the name of Leube's meat solution, which is said to be of agreeable taste, great nutritive value and admirably suited to cases of apepsia.* Uffelmann has suggested the use of this preparation in dysentery,† but I am not aware that it has anywhere been sufficiently used to give a fair notion of its utility. The same remark may be applied to the internal administration of *pancreatin*, and of peptones prepared out of the body by the action of this substance.‡ In short, it may be said that the investigations hitherto made in connection with pancreatin, like those relating to pepsin, serve rather to indicate the importance of further studies than to determine either the best methods of manufacture or the precise usefulness of the resulting preparations.

The use of finely hashed *raw meat*, found by Weisse,§ at the Children's Hospital, St. Petersburg, so advantageous in the diarrhœa of recently weaned infants, was extended by Trousseau to the chronic diarrhœa of adults with considerable success.‖ Méran employed it with doubtful results in the latter stages of acute dysentery.¶ Savignac** remarked that, while he had never himself employed this method, he was in the habit of directing

* LEUBE—*Ueber die Therapie der Magenkrankheiten*, No. 62 of the Sammlung Klinischer Vorträge von R. Volkmann, Leipsic, 1873, S. 511. Singularly enough, in the American edition of Ziemssen's Cyclopædia, Vol. VII, New York, 1876, p. 474, it is stated in a "Translator's Note" that this lecture "simply states: this solution is prepared by digesting meat with a strongly acid solution of pepsin in hermetically sealed vessels, at a temperature much higher than that of the human stomach," whereas the point of LEUBE's method, as explained in the lecture, is that no pepsin is used. I may add that the lecturer cautions the reader against the use of any "Fleischsolutionen" except those prepared by Herr Hofapotheker Dr. Mirus in Jena. These keep admirably, but alas! the lecturer often meets at the bedside badly prepared solutions made by other people!!—S. 513. After this we need not be surprised to learn from LIEBREICH—p. 161, *op. cit.*, last page—that the use of the peptones has "great disadvantages, by reason of the readiness with which they decompose into those very disagreeable substances, leucine and tyrosine." He adds: "It is unnecessary to speak of their very disagreeable physical character; these products of the decomposition of the peptones are incapable of supporting the nutrition of the body; and as the object of the administration of the peptones is to make them readily available for such absorption, the promptitude with which they enter on the stage of decomposition is a very serious drawback. There is also great difficulty in preparing them in a state of purity; and even if this be successfully achieved, I believe it would still be much better to entrust the work of preparing the peptones to the stomach, and aid it in the task, when necessary, by the administration of pepsin."

† UFFELMANN—S. 248, *op. cit.*, p. 328, *supra*—declared that he would give it a trial in the next epidemic of dysentery, though he expressed doubts as to how far it is likely to prove useful; for in the less severe cases the stomach is still able to form peptones, and in those more severe ones in which it cannot, it is probable enough that the power of assimilating the peptones after they are absorbed has also been lost.

‡ The modern therapeutic employment of pancreatin, like that of pepsin, is chiefly due to CORVISART. It is true, as he himself frankly stated—*Sur une fonction peu connue du pancréas; la digestion des aliments azotés*, Gaz. Hebdomadaire de Méd. et de Chir., T. IV, 1857, p. 250—that PURKINJE and PAPPENHEIM—see the note of G. VALENTIN, *Einige Resultate der im Sommer des gegenwärtigen Jahres zu Breslau über künstliche Verdauung angestellten Versuche*, Froriep's Notizen, Bd. L, 1836, S. 211—had long before observed that the pancreas yielded a juice which digested nitrogenous matters, as indeed had previously been indicated by EBERLE; compare F. A. LONGET—*Traité de Physiologie*, 2me Éd., T. I, Paris, 1861, p. 268. But the influence of CORVISART's paper, just cited, and his subsequent essay—*Fonction digestive énergique du pancréas sur les aliments azotés*, Gaz. Hebd., &c., T. VII, 1860, p. 483 *et seq.*—undoubtedly stimulated modern investigation into this function of the pancreas, and suggested the therapeutic employment of pancreatin, which has come into extensive use. It appears, however, to prove most serviceable when employed to emulsify fatty matters before taking them into the stomach. Against its therapeutic use to assist in the digestion of nitrogenous food may be urged the objection of LIEBREICH—*loc. cit.*, note *, *supra*—that it must, "when administered by the mouth, pass through the stomach, which by its acid secretions modifies or destroys" its efficacy as a ferment. I do not know of any attempt to use therapeutically the peptones prepared out of the body by the action of pancreatin, unless we class under this head the meat-pancreas injections which LEUBE—*Ueber die Ernährung der Kranken von Mastdarm aus*, Deutsches Archiv für Klin. Med., Bd. X, 1872, S. 1 *et seq.*—has recommended for cases in which stomach digestion is impossible.

§ J. F. WEISSE, Director of the Children's Hospital at St. Petersburg—*Von der Diarrhoe entwöhnter Kinder, oder der Diarrhœa ablactatorum und deren Kur durch rohes Fleisch*, Jour. für Kinderkrankheiten, Bd. IV, 1845, S. 29; compare his report thirteen years later on his continued success with this treatment, *Rückblick auf den Gebrauch des rohen Fleisches in der Diarrhœ entwöhnter Kinder*, Vorgetragen am 19 Sept. v. J. in der Versammlung der deutschen Naturforscher u. Aerzte in Bonn—same Jour., Bd. XXX, 1858, S. 60.

‖ The plan of WEISSE had been received in France with considerable incredulity. Note the scornful "Réflexions" appended to Art. 3087, *De l'emploi de la viande crue pour combattre la diarrhée chez les enfants récemment serrés*, Jour. de Méd. et de Chir. Pratiques, T. XVI, 1845, p. 440: "La viande crue est la nourriture de certaines peuplades à demi sauvages; et nous avons vu, lors de l'invasion de 1815, des Cosaques manger avec délices des chairs presque palpitantes, et qui avaient à peine été approchées du feu. Le robuste appétit de ces hommes et leur voracité proverbiale pouvaient s'accommoder d'une semblable nourriture; mais il n'y a nulle ressemblance entre l'état de l'estomac d'un Cosaque bien portant et celui d'un enfant nouvellement sevré, et qui ne peut supporter une alimentation trop substantielle." In spite of this kind of opposition, TROUSSEAU succeeded in introducing the use of raw meat into French therapeutics, and early extended its employment to the case of adults laboring under chronic fluxes. See an article entitled *De l'emploi de la pulpe de viande crue dans le traitement de la diarrhée chronique chez les enfants*, Bull. Gén. de Thér., T. LVI, 1859, p. 449; also T. III, p. 123 *et seq.*, *op. cit.*, p. 664, *supra*. To overcome the disgust of sensitive adults he mixed the finely hashed raw meat with a little conserve of roses and prescribed it under the name of "*conserve de Damas*."

¶ MERAN—Bull. des Séances de la Soc. de Méd. de Bordeaux, Nov. 7, 1859. L'Union Médicale de la Gironde, An IV, 1859, p. 516—administered hashed raw meat, flavored with currant jelly, to a dysenteric patient after the acute accidents of the disease began to diminish and the feebleness became marked. At first it appeared to have a good result, but in a few days the patient began to feel disgust, not on account of the taste, but because it was not digested. Pepsin was then added with temporary advantage, but the patient died. In a second case he was more fortunate, and the patient recovered.

** SAVIGNAC—p. 457, *op. cit.*, p. 620, *supra*. A good account of the raw-meat treatment is given by FONSSAGRIVES—p. 610 *et seq.*, *op. cit.*, p. 618, *supra*. See also R. DRUITT—*On the use of raw meat in diarrhœa and dyspepsia*, Med. Times and Gaz., Vol. II, for 1870, p. 4. BARRALLIER—p. 785, *op. cit.*, p. 603, *supra*—thinks raw meat is advantageous and ought to be used in chronic dysentery, especially during convalescence.

convalescents from chronic dysentery to eat their beefsteaks and cutlets as rare as possible. Undoubtedly the fine hashing of the meat renders it easier to digest, and it is probable that rare or underdone meat is more digestible than that which is thoroughly cooked; whether raw meat has any additional advantages is exceedingly problematical.

*Oysters*, which were regarded by Galen as exercising a restraining influence upon the bowels, were recommended by Alexander of Tralles* as well suited for the alimentation of patients laboring under rheumatic dysentery. Savignac† praises them highly. He often recommended convalescents from dysentery to visit seaside resorts where oysters abound, and partake of them freely; and found that, besides the nutritive value of this acceptable food, it seemed to aid in reëstablishing the normal functions of the intestine. Weisse‡ found them efficacious in the lientery of adults; eight to a dozen taken twice a day often suffice to cure. The Atlantic coast of the United States is remarkable for the size and fine flavor of its oysters. They have been extensively prescribed by our physicians, and during the civil war were purchased in considerable quantities, with the hospital fund of many of the general hospitals, for the use of patients laboring under fluxes. They are to be regarded as highly nutritious, very readily digestible food, and may be used raw, stewed, roasted or steamed, but should not be broiled or fried for patients laboring under fluxes.§ They may be given in acute cases after the first violence of the disease is passed, but are especially suited to convalescents and those who suffer from chronic fluxes. Savignac has correctly stated that in certain cases they disagree and appear to aggravate the flux. This is, however, seldom the case if they are perfectly fresh; if stale they are capable of provoking intestinal disturbance even in healthy subjects.

*Eggs* have long enjoyed a deserved reputation in the alimentation of dysenteries. Cooked in various ways they were employed for this purpose by the Greek physicians.‖ The use of egg-albumen as a drink has already been discussed.¶ The whole egg may often be used raw as food; the white and yolk being beaten up separately and afterwards mixed with the addition of a little sugar and Sherry wine. Eggs may frequently also be advantageously added to the farinaceous preparations, and with milk and brandy, in the form of milk punch, constitute a concentrated form of nourishment which is often useful in the prostration or collapse of diphtheritic cases. Poached or soft-boiled eggs and light omelets are suitable for convalescents and for chronic cases. In not a few cases, however, eggs disagree, as indicated by uneasy feelings in the stomach and eructations impregnated with sulphuretted hydrogen. On this account they have acquired the reputation of being bilious, and therefore unsuitable for dysenterics. Degner** was quite right in ridiculing

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* GALEN—*De Simpl. Med. Temp. ac Fac.*, Lib. III, Cap. 15, [Ed. Kühn, XI, p. 576,]—asserts the juice of the oyster to exercise a relaxing effect, while the flesh restrains the belly. In *De Aliment. Fac.*, Lib. III, Cap. 33, [*Id.*, VI, p. 734,] he remarks that the flesh of oysters does not easily corrupt in the bowels, and therefore is often useful for those in whom corruption of the food is likely to occur, on account of disease of the liver or bowels. ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 441, Ed. cited p. 624, *supra*—advised the use of oysters in rheumatic dysentery. He recommended that they should be roasted in their shells, saying that they assist digestion and restrain the belly.

† SAVIGNAC—p. 460, *op. cit.*, p. 620, *supra*. ‡ WEISSE—S. 64, second paper cited note §, last page.

§ For this purpose if the oysters are stewed it is best to thicken the juice with a little flour, bring it to a boil, drop in the oysters and take them off the fire at once; their flesh is thus set without being shrunk. This is better than the common practice of stewing them in milk. Prolonged stewing makes them tough and more difficult to digest. Steamed oysters are an American dish; the oysters are cooked in the shell by exposing them to steam for a few minutes; they should be done rare. Broiled and fried oysters are chiefly objectionable on account of the fat employed in these modes of cooking.

‖ Thus, in ÆTIUS—Tetrab. III, Serm. 1, Cap. 45, p. 604, Ed. cited p. 644, *supra*—starch cooked with eggs and milk is advised for the nourishment of dysenterics; also (p. 605) the yolks of eggs roasted with a little vinegar, sumac and oil. ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 442, Ed cited p. 624, *supra*—writes, in connection with the alimentation of rheumatic dysentery: "Thus hens' eggs poached in pesca till hardened are advantageous, but their yolks roasted over live coals and rubbed with vinegar and Syrian sumac are more astringent."

¶ See p. 664, *supra*.

** DEGNER—§ 76, p. 192, *op. cit.*, p. 625, *supra*—declares that eggs are not to be dreaded on account of the vain fear of the vulgar that they augment the bile, but rather possess to a high degree demulcent and, at the same time, nutrient properties. SAVIGNAC—p. 456, *op. cit.*, p. 620, *supra*—thinks the usefulness of eggs in dysentery limited on account of the fat contained in their yolks.

this notion; nevertheless it would be bad practice to insist upon the employment of this article of food in cases in which the slightest gastric disturbance follows its use.

The *cooked flesh* of various mammals and birds* is sometimes admissible in the diet of convalescents and of chronic cases. Beef or mutton, roasted or broiled, the former especially should be done rare, chickens and partridges, are among the most suitable for this purpose. Fish as a rule are best avoided, unless particularly craved by the patient, when moderate quantities may be allowed and the effect watched.

*Fresh vegetables and fruits.*—Vegetables and fruits are not to be blindly avoided by patients suffering with fluxes, as some have directed.† The Greek physicians employed them in moderation even in dysentery, giving preference for the most part to such as were supposed to possess astringent virtues, though Alexander of Tralles boldly recommended the use of laxative fruits in certain cases.‡ This practice had long been undeservedly neglected,§ when in modern times attention was again directed to the use of these articles of diet, partly on account of their laxative effect, but chiefly because of their antiscorbutic properties. Abundant testimony has already been adduced to show the benefit derived from the use of fruit and fresh vegetables in the fluxes of the civil war,‖ and like effects may be anticipated whenever diarrhœa or dysentery is complicated by the scorbutic taint. When the latter condition precedes the flux, which may often be regarded as indirectly its result, the importance of an antiscorbutic regimen is of course apparent. But it should not be forgotten that during the long-protracted course of chronic cases a scorbutic taint, or scurvy itself, may be generated by a diet insufficient in variety, and from which vegetable food is too rigorously excluded. This accident is even more prone to occur in military practice in times of war than in civil life, because a tendency to the scorbutic condition is so frequently present, even when no symptoms express its existence, and a shorter time is therefore required for the development of scorbutic phenomena by unsuitable diet than would be needed under ordinary circumstances.

A suitable admixture of vegetables and fruits is therefore desirable in the alimentation of convalescents and chronic cases even when no scorbutic symptoms have as yet appeared; if these latter are recognizable a decidedly antiscorbutic regimen is imperatively demanded.

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* The qualities of flesh of various kinds are discussed in the Hippocratic writings; *e. g.*, in *De Affectionibus*, § 52, [Ed. Littré, VI, p. 263;] *De Victus Rat.*, Lib. II, § 46–49, [same Vol., p. 545;] and *De Victus Rat. in Morb. Acut.*, Append., § 18, [same Ed., II, p. 489.] GALEN has treated of the subject at great length; see especially *De Aliment. Fac.*, Lib. III, [Ed. Kühn, VI, p. 660 *et seq.*] The opinions expressed in these works may be compared with interest with those of modern writers; see, for example, FONSSAGRIVES—p. 94 *et seq.*, *op. cit.*, p. 618, *supra*, and PAVY—p. 131 *et seq.*, *op. cit.*, p. 670, *supra*—who has also given—p. 190 *et seq.*—an interesting enumeration of certain exceptional animal foods.

† For example, SAVIGNAC—p. 456, *op. cit.*, p. 620, *supra*—forbids, in the alimentation of dysenterics, the use of "les légumes, les herbages, les fruits crus, les fruits acides surtout."

‡ Thus we have already seen—note §, p. 624, *supra*—that GALEN commended apples, especially sour apples cooked with bread, in cases of diarrhœa and dysentery; elsewhere—*De Rem. Parab.*, Lib. I, Cap. 10, [Ed. Kühn, XIV, p. 370,]—he advises for cœliacs and dysenterics a preparation made by boiling down quinces, pomegranates and sorb-apples. ÆTIUS—Tetrab. III, Serm. 1, Cap. 45, p. 605, Ed. cited p. 644, *supra*—commended the employment in dysentery of a pottage made with dry bread, to which dates, quinces, pears, &c., were sometimes added. He praises lentils cooked with plantain or pomegranates, and flavored with a little vinegar and oil, as possessed of astringent virtues. He remarks that he does not much approve of garden herbs, yet does not prohibit their moderate use, and mentions boiled endives, plantain, heath and cabbage twice boiled in water and afterwards in posca, as suitable. Fruits also should be sparingly employed; if craved, cooked pears, quinces, medlars, pomegranates, &c., may be permitted. ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 439, Ed. cited p. 624, *supra*—advises, in rheumatic dysentery, the use of lentils, and—p. 441—the more astringent garden herbs, especially endives, plantain and black beets. They may be cooked and flavored with vinegar, or, such as are suitable, eaten raw with bread. Cabbage twice cooked possesses drying virtues. The astringent fruits are also commended—p. 443—but sweet fruits should be prohibited, because they generate flatus and readily acidify. Nevertheless, as we have already seen—note §, p. 624, *supra*—he elsewhere commends the use of laxative fruits, such as damsons and grapes in ulcerative dysentery. I may add that, of the Arabian physicians, RHAZES—*Ad Mansor. de Re Med.*, Lib. IX, Cap. 72, Basel, 1544, p. 259—commends for dysenteries a preparation made by boiling pomegranates with raisins in water to which a little vinegar has been added; HALY ABBAS—*Practic.*, Lib. VII, Cap. 22, Lyons, 1523, fol. 246—pears, Pontic apples and medlars; and AVICENNA—*Canon*, Lib. III, Fen 16, Tract. 2, Cap. 7, p. 823, Ed. cited p. 632, *supra*—Indian melons.

§ ACKERMANN—p. 120 *et seq.*, *op. cit.*, p. 620, *supra*—recounted with praise the practice of the ancients in this matter, but his liberal views did not find many followers. Indeed such instances as that related by ROMMEL—note ‡, p. 625, *supra*—and that of the Swiss regiment mentioned by TISSOT—p. 625, *supra*—in which fruit was beneficially used in the treatment of dysentery, occurred quite as often before as immediately after his time.

‖ See p. 626, *supra*, especially the references in note ‡, to which I may add the testimony of W. KEMPSTER—p. 344, *op. cit.*, p. 493, *supra*—who testifies to the speedy diminution of fluxes among our troops during the war whenever they obtained access to green corn in the fields.

Lime or lemon juice mixed with water and sweetened may be advantageously used for this purpose, as was first pointed out by J. Heurnius and his son Otto* in connection with the scorbutic dysentery of the East Indies. It constitutes an agreeable drink which is generally well relished by convalescents and chronic cases, and seldom gripes or disturbs the bowels if sound fruit is used. Orangeade and drinks made from other fruit juices may be employed for the same purpose, but are for the most part more apt to disagree.

In selecting vegetables for the diet of convalescents from dysentery and patients suffering with chronic fluxes, preference should be given to those which are most readily digestible, and care should be taken to reject those which are not perfectly sound and fresh. Potatoes, lauded by Degner† as an innocent food which dysenteries may employ with impunity, are justly regarded as possessed of eminent antiscorbutic virtues, and, as they stand transportation reasonably well, are well adapted for use in military hospitals. These advantages are shared to a certain extent by onions,‡ which, although less nutritious than potatoes, are perhaps more valuable as antiscorbutics; they may be given boiled, or may be sliced and flavored with vinegar and salt. Leeks may be substituted for onions, when they can be obtained fresh, and are relished by the patients. Among the numerous other vegetables that are suitable for this purpose, squashes, pumpkins, carrots, turnips and tomatoes may be particularly mentioned. It may be laid down as a rule, that vegetables containing much cellulose and other indigestible matters which must pass unaltered through the alimentary canal, are to be avoided as much as possible, or, if used, should be boiled until quite tender; with this precaution such vegetables as spinach or even cabbage can often be employed with benefit. Lettuce, if tender and fresh, can often be safely eaten raw as salad, and tomatoes or even potatoes may be employed in the same way.

Any of these vegetables may be advantageously boiled with the soup or beef tea prepared for patients laboring under fluxes. This is particularly desirable if the presence of a scorbutic taint is recognized or suspected. For those suffering with acute dysentery the solid vegetable fragments should be strained out after boiling, and the same may be done in other cases if they appear to disturb the digestive organs; but during convalescence, and the chronic fluxes, this precaution is seldom necessary, and the well boiled vegetable fragments served with the soup are not only innoxious but exercise a salutary influence. In whatever way administered, however, vegetable food should be given in moderate quantities, its effects watched, and the use of any article that appears evidently to disagree with a particular patient should be at once discontinued.

The same precautions should be used in the employment of ripe fruit, which may also be given in moderation to the same class of cases on account of its antiscorbutic virtues. It is also perhaps advantageous because of the laxative effect it induces. This latter affords a probable explanation of the success of the New England physicians who treated acute fluxes with watermelons and peaches,§ though probably the diuretic effect of the melons was also advantageous. Almost any sound ripe fruit may be selected for the purpose in

* J. HEURNIUS, in a note to FERNELIUS—*Universa Medicina, Pathologia*, Lib. VI, Cap. 10, Geneva, 1679, p. 525—remarks: "Those who returned from Java to Amsterdam in the year 1597 relate that a great part of their number perished from dysentery, produced by using spoiled meat, until they found a specific (alexipharmicon) in a mixture of garlic with sugar and lemon-juice." And OTTO HEURNIUS adds in the next note: "Those who sail to the East Indies sometimes fall into dysentery from the use of putrid flesh, for which the most immediate remedy is garlic with sugar and lemon-juice." I may add that HAUFF—S. 438, *op. cit.*, p. 534, *supra*—commends the use in dysentery of acid fruit-juices mixed with water, as lemonade, orangeade, &c., but only on account of their efficiency in allaying thirst.

† DEGNER, see p. 666, *supra*.

‡ Potatoes and onions were the vegetables most liberally supplied to our hospitals during the civil war. They were used with advantage by patients laboring under chronic fluxes and by convalescents; and the only complaints I have heard refer to the difficulty of obtaining them in sufficient quantities.

§ See p. 627, *supra*.

view. Grapes at the Cape of Good Hope, and the Bael fruit in India, have been loudly praised. In our own country blackberries are popularly believed to possess special anti-diarrhœtic properties; but it is doubtful how far this reputation is deserved, and the numerous seeds are not always innoxious.*

VENESECTION.—The older Greek physicians do not appear to have resorted to bleeding in the treatment of the fluxes. Its use for this purpose is not mentioned in the Hippocratic writings, and Galen expressly forbids it.† Among the later Greeks, Ætius and Alexander of Tralles commend the cautious use of this operation in young vigorous subjects laboring under acute dysentery, with the view, as the former explains, of evacuating a portion of the peccant humor, of mitigating the inflammation, and, by revulsion, preventing the blood from accumulating in the intestine. They direct the blood to be drawn from the right arm at the beginning of the disease, and in small quantities only, repeating the abstraction at intervals if necessary.‡ Some of the Arabian physicians§ adopted this practice, which was long very generally inculcated by systematic writers.‖

Against even this moderate use of bleeding in dysentery an earnest protest was made by Rondeletus, whose views were more or less closely followed by Felix Plater, Septalius and Willis.¶ On the other hand, Botallus advocated its employment in this disease with the same extravagance with which he recommended its use in other inflammatory and

* CURTIS—*An Account of the Diseases of India, etc.*, Edinburgh, 1807, p. 144—says, speaking of the treatment of dysentery in the Naval Hospital at Madras, 1782-3: "In the secondary stages, we never forbade the use of fruits, especially such as were astringent; as the mango, and guavo or pomegranate; and we always directed a part of the rind to be eaten along with them. They were grateful and useful antiseptics; only, much of the pomegranate rind was too strongly astringent to be used indiscriminately." He adds in a foot note, p. 145: "The author of these observations was reduced to as low a state by bilious flux as ever any European in India. The first turn towards recovery was found at the hospitable tables of Vizagapatam, where all the tropical fruits were in plenty. Nature and appetite prompted strongly, and the fullest indulgence was followed, not only with impunity, but with manifest advantage." The preference for astringent fruits here indicated is quite in accord with the ideas of the ancients. According to Sir JAMES RANALD MARTIN—*Practical observations on the nature and treatment of the diseases of Europeans on their return from tropical climates*, The Lancet, 1853, Vol. II, p. 53: "The subacid fruits have long been used" in the treatment of chronic diarrhœa and dysentery "in the south of Europe, in the East and West Indies, and the grapes of the Cape of Good Hope have during many years been celebrated for their efficacy in the chronic bowel disorders of the numerous invalids who annually resort to that colony from the Indian presidencies." The success of the "Grape Cure" of dysentery is also referred to by W. C. MACLEAN—Vol. I, p. 123, *op. cit.*, p. 657, *supra*—who suggests that it is in the scorbutic form of the disease it has been found so efficacious. He adds a caution with regard to the grape seeds: "I remember the case of a young officer at Secunderabad, who, while convalescing from acute dysentery partook freely of grapes. Shortly after, he was seized with all the symptoms of peritonitis from perforation, and rapidly sunk. After death it was found that a grape stone had become entangled in one of the half cicatrized ulcers in the colon, where it acted like a pea-issue; a minute perforation resulted, causing the death of the patient." In the same passage he speaks very highly of the use of the fresh Bael fruit, but adds: "Bael fruit has often fallen into disrepute as a remedy in dysentery, simply from its indiscriminate use. My conviction is that where there is no scorbutic taint it is without efficacy." On the subject of this article see GRANT—*Note on the preparations and uses of the Bael fruit*, The Indian Annals of Med. Sci., Vol. II, 1854-5, p. 225; and MARTIN—*loc. cit., supra*; see also, by the same author, p. 690, *op. cit.*, p. 621, *supra*. MACLEAN—*loc. cit., supra*—also remarks: "Many of the invalids from India, suffering from chronic dysentery, arrive at Netley in a more or less scorbutic state; all are benefited and some cured, simply by causing them to use whatever fruits are in season."

† GALEN—*Comm. IV in Hippoc. de Acut. Morb. Victu*, § 98, [Ed. Kühn, XV, p. 908:] "If there is a flux of the belly, do not bleed; for if the flux continues after the loss of blood, the strength of the patient will be prostrated." The same view is expressed in *Ad Glauconem de Med. Meth.*, Lib. I, Cap. 15, [Ed. Kühn, XI, p. 43.]

‡ ÆTIUS—Tetrab. III, Serm. I, Cap. 45, p. 606, Ed. cited p. 644, *supra*—explains the action of bloodletting as follows: "Non enim ob multitudinem sanguinis evacuandam sectionem facimus, sed ut materiam quasi per rivos transferamus. Paucus autem sanguis etiam multo tempore emissus, inflammationem mitigat, et sanguinis ad intestina delationem revellit, innatumque calorem sensim refrigerans, somnum magis quam animi deliquium inducit." ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 435, and Cap. 9, p. 457, Ed. cited p. 624, *supra*—commends the same practice, but without expounding the reasons.

§ Thus, for example RHAZES—*Ad Mansor Divisionum*, Lib. I, Cap. 67, p. 390, Ed. cited p. 678, *supra*—counselled bleeding from the arm in bilious dysentery. (fluxus ex copia bilis.)

‖ Among these I may mention GORDONIUS—*Lilium Medicinæ*, Venice, 1496, Partic. V, Cap. 14, fol. 161; ALTOMARUS—*Ars Med.*, Cap. 74, Opera, Venice, 1574, fol. 182; HOLLERIUS—*De Morb. Intern.*, Lib. I, Cap. 40, Venice Ed., 1572, fol. 119; FORESTUS—*Obs. et Cur. Med.*, Leyden, 1596, Lib. XXII, Obs. 34, Scholia, p. 375; FAB. HILDANUS—Cap. 8, p. 684, *op. cit.*, p. 644, *supra*; SENNERTUS—p. 131, *op. cit.*, p. 645, *supra*; and RIVERIUS—*Prax. Med.*, (Paris, 1640,) Lib. X, Cap. 6, Opera, Lyons, 1679, p. 302. Most of these writers followed pretty closely the indications laid down by ÆTIUS and ALEXANDER, and bled from the arm; usually the right arm, as directed by ÆTIUS. HOLLERIUS mentions that some physicians prefer to open a vein in the hand as less debilitating, while others bleed at the ankle, which, however, he regards as more debilitating than bleeding from the upper extremity. HILDANUS did not think the quantity taken should ever exceed six or eight ounces.

¶ RONDELETIUS—*Methodus Curandi Morbos*, (1583-5,) Lib. III, Cap. 20, Opera Omnia, Geneva, 1620, p. 457—declared that those who let blood in dysentery do so without judgment or utility, and with great injury to the sick, debilitating the patient without checking the flow of bile or benefiting the ulcers. He explains that these remarks apply to true dysentery only, for a mere hæmorrhage from the intestine (dysenteria cruenta) may sometimes be checked by bleeding. FELIX PLATER—*Praxeos*, Basel, 1736, T. III, Lib. II, Cap. 11, p. 811—regarded bloodletting as of little advantage in this disease; it cannot evacuate from the mesenteric veins, and still further weakens the debilitated powers of life. L. SEPTALIUS—*Animad. et Caut. Med.*, (1629,) Padua, 1652, Lib. VII, § 95-6, p. 226—thought bloodletting seldom required; if used at all, the precepts of ÆTIUS and ALEXANDER should be followed. WILLIS—*Pharm. Rat.*, (1763,) Opera, Geneva, 1680, Sect. 3, Cap. 3, p. 74—declared that bloodletting was not well borne in the London dysentery of 1670.

febrile disorders, and Sydenham* not only bled freely in the acute dysentery of vigorous adults, but claimed that he had drawn blood with advantage even in the case of children, and in chronic dysentery.

The avowed objects of bloodletting were now to cure the intestinal inflammation and to diminish the accompanying fever. For these purposes, with more or less caution as to the amount of blood taken, and more or less restriction of the operation to the so called inflammatory cases, it was employed by the majority of physicians.† Even the great English army surgeons, Pringle and Donald Monro,‡ together with such observers of tropical diseases as Bontius, Hillary and Moseley,§ were swept along with the current of medical opinion. The positive declaration of Degner that, during the Nimeguen epidemic, bloodletting aggravated the symptoms and was often speedily followed by a fatal issue, and the example of Zimmermann, who entirely discarded it during the Swiss epidemic of 1765, although supported by the experience of such excellent practitioners as Rollo and Hunter,‖ did not suffice to bring about any radical change in the prevailing mode of practice; yet doubtless the recorded opinions of these eminent men were not without influence in the direction of moderation. Of still greater weight in the same direction were the teachings of Cullen: While admitting that it might sometimes be necessary to bleed vigorous patients at the beginning of the disease, and, even if inflammatory symptoms be present, to repeat the operation, he pointed out that the accompanying fever is apt to be of a putrid nature, and insisted upon the necessity of caution in this matter.¶

* L. BOTALLUS—*De Cur. per Sang. Missionem*, Lyons, 1577-80, Cap. 4; I cite Opera Omnia, Leyden, 1660, p. 132 *et seq.* The unfortunate advice of this celebrated advocate of bleeding has been only too extensively followed. He declared venesection to be not less desirable in dysentery than in pleurisy, and supported his position by elaborate arguments and by illustrative cases. SYDENHAM—Vol. I, p. 170, *op. cit.*, p. 407, *supra*—explains his practice in the following emphatic words: "As soon as I was sent for, I bled from the arm." Infants are to be treated in the same way, only with d fference of degree in the amount of blood drawn, p. 172. An instance of a woman afflicted with a chronic flux for three years, who was treated by repeated venesection only, will be found on p. 176.

† Already SENNERTUS—*loc. cit.*, last page—who still believed that by bleeding it was possible to evacuate the peccant humors, insisted especially upon its employment if fever be present, as well as if the dysentery proceeds from inflammation of the intestine, or if inflammation be threatened. He also insisted upon the importance of bloodletting if the liver be involved, (see RHAZES—*loc. cit.*, last page,) or if some accustomed flux is suppressed. So, likewise, ROLFINCIUS—*Epit. Meth. Cognosc.*, Jena, 1655, Lib. III, Cap. 17, p. 298—employed bloodletting when there was inflammation and fever, but only in symptomatic, not in critical dysentery. HOFFMANN—*Med. Rat. Syst.*, T. IV, Pars 3, Sect. 2, Cap. 7, Opera, Geneva, 1740, T. III p. 158—declared an extensive experience had convinced him that bleeding is desirable at the beginning of the disease in plethoric persons. Among those who followed the current I may name RICHARD MEAD—*Monita et Præcepta Medica*, (1751,) Cap. VII, Sect. 1; I cite Medical Works, Edinburgh, 1763, Vol. III, p. 61—who observed: "Wherefore, to come to the cure, the first thing to be done is to draw blood;" WILSON—*An essay on the autumnal dysentery*, London, 1761, p. 27; AKENSIDE—*De dys. comm.*, London, 1764, Cap. 2, p. 31; MACBRIDE—p. 465, *op. cit.*, p. 664, *supra;* BAKER—p. 25, *op. cit.*, p. 437, *supra;* STOLL—Pars III, p. 290, *op. cit.*, p. 342, *supra;* GEACH—p. 21, *op. cit.*, p. 660, *supra.*

‡ PRINGLE—Cap. 6, p. 260, 7th Ed., *op. cit.*, p. 640, *supra:* "Bleeding is sometimes indispensable, and indeed is generally conducive to the cure." Yet, to his credit be it said, he adds: "In weakly habits, and in contagion, with few feverish symptoms, I wholly omit that evacuation." DONALD MONRO—p. 68, *op. cit.*, p. 625, *supra:* "When the patients were strong, and complained of sharp pain of the bowels, attended with a fever, we used the lancet freely."

§ BONTIUS—*De Med. Indorum*, Leyden, 1718, (bound with the *Med. Ægypt.* of PROSPER ALPINUS,) Lib. III, Cap. 4, p. 66—bled, however, only in the hepatic flux, and remarks that the operation was not well borne by the Dutch at Batavia, because, on account of the heat of the climate they were disposed to debility; hence he bled them only in cases of the greatest necessity; on the other hand, the Portuguese and Javanese, being inured to heat, bear large bleedings well, "expertus, credite, lequor." HILLARY—*Obs. on the Changes of the Air, etc., in the Island of Barbadoes*, (1759,) 2d Ed. London, 1766, p. 208—was more indiscriminate in his practice, remarking: "It is always necessary to take away some blood." MOSELEY—p. 229, *op. cit.*, p. 648, *supra*—in like manner observes: "Bleeding being an operation of great consequence in the flux, the cure is generally begun with it, repeating it as the symptoms authorise."

‖ DEGNER—Cap. 5, § 10, p. 267, *op. cit.*, p. 625, *supra.* His language is: "Ast venæ sectioni in nostro morbo nullus locus erat nec eam in ullo, sive præservationis, sive curationis gratia, administrandam curavi; bilem enim non corrigit, sed potius vires vitæ frangit et naturam in motibus suis salutaribus conturbat: unde vomitus cruentus et mors venæ sectionem cito sequebantur." ZIMMERMANN—Cap. 10, S. 289, *op. cit.* p. 648, *supra*—admits, indeed, scholastically the propriety of bleeding in inflammatory dysentery, but held—S. 389—that it is unnecessary in bilious dysentery, and does not appear ever to have used it in the Swiss epidemic. ROLLO and HUNTER were both medical officers of the British army: J. ROLLO—*Obs. on the Acute Dysentery*, London, 1786, p. 46—"condemned venesection, because, he said, inflammation was not necessarily connected with the beginning of dysentery. When it was so, he declared, that it partook more of the erythematic or superficial kind, and was not associated with the inflammatory diathesis, but dependent on 'causes acting immediately on the interior surface of the intestine.'" I have not seen ROLLO's work, and cite from the essay of J. EWART—*A review of the treatment of tropical diseases*, The Indian Annals of Medical Science, No. XVI, 1853, p. 345. J. HUNTER—p. 237, *op. cit.*, p. 637, *supra*—observed: "All that I have learned on the subject amounts to this, that in slighter cases, or when the disease is treated early, purgatives have proved so effectual, that I have never had recourse to bleeding: and when the disease has been more violent, the strength of the patient has been so much reduced of a sudden, that I have not dared to make use of that evacuation."

¶ CULLEN—*First Lines*, § 1085, Vol. II, p. 227, Ed. cited p. 648, *supra:* "At the beginning of this disease, when the fever is any way considerable, bloodletting, in patients of tolerable vigour, may be proper and necessary; and when the pulse is full and hard, with other symptoms of an inflammatory disposition, bloodletting ought to be repeated. * * * But as the fever attending dysentery is often of a putrid kind, or does, in the course of the disease, become soon of that nature, bloodletting must be employed with great caution."

These conservative views were very generally accepted during the latter part of the last century and the beginning of this,* but the publication of the work of James Johnson (1813) was followed by a pretty general revival of the practice of Sydenham. Johnson advised a liberal resort to bleeding to be "employed without the smallest apprehension of that bugbear—debility."† Hennen, Somers and Bampfield adopted a similar practice, but even the freedom with which Botallus bled was exceeded by the frantic excesses of O'Halloran.‡ Not a few of the English physicians in the East Indies have followed the example of Johnson in this matter;§ and the influence of the doctrines of Broussais undoubtedly aided in maintaining the practice in Europe, where it has been defended by some able physicians until a comparatively recent period.‖ Meanwhile, however, the experience of the

* Thus J. P. FRANK—*De Cur. Hom. Morb. Epitome*, § 693, T. III, p. 448, Ed. cited p. 393, *supra*—advised to bleed, even to repeat the operation in the commencement of sthenic, but not in asthenic dysentery. So also PINEL—*Nos. Phil.*, T. II, p. 335, Ed. cited p. 605, *supra*—counselled bleeding only in dysentery complicated with inflammatory fever. FOURNIER et VAIDY—p. 374, *op. cit.*, p. 362, *supra*—held that bleeding may be necessary at the beginning of a simple dysentery, is essential in inflammatory dysentery—p. 391—but is not indicated in mucous and bilious dysentery, still less in adynamic dysentery, or dysentery complicated with typhus, p. 394 *et seq.* VIGNES—*Traité complet de la dysenterie et de la diarrhée*, Paris, 1825, p. 270—bled only if the inflammation was violent and in a robust subject.

† JAMES JOHNSON—*The Influence of Tropical Climates on European Constitutions;* I cite the 4th Ed., London, 1827, p. 218: "When blood appears alarmingly in the stools, whether the fever run high or not, venesection may be employed without the smallest apprehension of that bugbear—DEBILITY." According to EWART—p. 347, *op. cit.*, last page: "Dr. Whyte, in 1799, was among the first physicians who bled, repeatedly, to syncope, in dysentery." I find a *Copy of a letter to his Royal Highness, the Duke of York*, by D. WHYTE, surgeon to his Majesty's ship Atlas, dated Aug. 10, 1799, in the Medical and Physical Journal, Vol. II, 1799, p. 283, in which he urges bloodletting in the strongest manner, remarking: "I have frequently taken from forty to fifty and sixty ounces of blood in a couple of hours, and in so doing, saved many valuable lives." In the same journal, Vol. III, 1800, p. 232, is a second communication by WHYTE, in which this treatment is further commended. EWART—*loc. cit.*—adds that Dr. WHYTE'S "untimely end, produced by his having inoculated himself with the matter of a 'plague bubo,' induced his professional brethren and the public to consider his experimental venesections, ad deliquium, as emanating from 'a well meaning but hot headed medical enthusiast.'" I suppose it is to WHYTE, JOHNSON refers when he remarks—p. 213, note, *op cit., supra:* "Dr. White used the same venesectio ad deliquium, in Egypt, in 1802," but his further remark, "and Mr. White, a navy surgeon, published a work nearly a hundred years ago, in which he lays down a still more decisive system of bloodletting in dysentery," I have not been able to verify, though I have taken some pains to do so.

‡ J. HENNEN, in a letter written in September, 1815, to SOMERS—p. 50, *op. cit., infra*—observes: "Venæsectionem iteratam quamdiu dolor presso sentiretur abdomine vel sanguis floridus fæcibus comoisceretur, remedium haud dubie potentissimum reperi et efficacissimum, cujus sane in hoc debellando morbo experimentum facere mihi contigerit." E. S. SOMERS—*Comm. quædam de dys.*, &c., London, 1816, p. 35—bled to sixteen ounces and repeated the operation daily for the first four days, after which, he naively remarks, he seldom found free bleeding necessary. R. W. BAMPFIELD—*A Practical Treatise on Tropical Dysentery*, London, 1819, p. 101 *et seq.*—declares: "I am able to prove its utility in tropical dysentery by the cases annexed," p. 102. In the preface to this work—p. ix—he exclaims: "If a human being be assailed by acute and active inflamoation of an internal organ—whether he be shaking on the icy shores of Greenland or burning beneath the Equinox—whether he be a white or an Ethiopian—young or old, male or female, of a firm tone or relaxed, in the hot or cold season—what do these considerations avail? Is there any remedy so indispensably efficacious in its subduction as bleeding?" THOMAS O'HALLORAN—*Account of the diseases most prevalent in the 64th regiment during the year* 1818, *whilst stationed in Gibraltar*, The London Medical Repository, N. S., Vol. II, 1824, p. 205—placed his patients in the recumbent position and bled to syncope: "From thirty-two to sixty-four ounces of blood were usually taken at the first bleeding." He insisted "that a much greater degree of debility is produced by an uninterrupted disease of twenty-four or thirty-two hours duration, than succeeds to the loss of ten pounds of blood abstracted within the tenth hour from the period of attack." Even after such a first bleeding, as is mentioned above, he sometimes repeated the operation on the same day. On the second day he bled again, twenty to forty-eight ounces. He considered it important to produce syncope, and declared that the loss of five to six pounds of blood is often insufficient for the accomplishment of the object. This paper is unfinished; the reader will be glad to learn—p. 208, note—that the rest of it was accidentally destroyed by fire.

§ GEORGE BALLINGALL—*Pract. Obs. on Fever, Dysentery*, &c., Edinburgh, 1818, p. 67—remarks: "Of this remedy I have to express a very favourable opinion;" but, while stating that "of the few cases of dysentery in which I have employed bleeding, the majority have, I think, terminated favourably," he admits that he had been restrained from a free use of the lancet partly by the debilitated condition of the patients, but also by "a due deference to the opinion of the older practitioners in India, which, at the time of our arrival there, was almost universally against it." On which BAMPFIELD—p. ix, Preface *op. cit., supra*—comments: "Had Mr. Ballingall asserted the dignity of reason, and adopted 'a practice of which he expresses a very favorable opinion,' the author feels convinced he would not 'have dissected 100 subjects dead from this disease and witnessed many more.'" ANNESLEY—Vol. II, p. 273, *op. cit.*, p. 621, *supra*—advised bleeding in acute dysentery, "if the patient has recently arrived from Europe, if he be of a full habit, if the pulse be full, hard and irritable, if the termina be violent, and pain fixed and increased on pressure;" he adds, "if the first bloodletting be sufficiently large, a repetition of the operation will be seldom necessary." Old residents and natives he did not bleed. In hepatic dysentery he thought general bloodletting usually required, and that it is often necessary to repeat the local abstraction of blood several times during the progress of the disease—p. 285—but he did not bleed in scorbutic dysentery or the chronic fluxes. TWINING—Vol. I, p. 69, *op. cit.*, p. 608, *supra*—bled more freely; sometimes repeating the operation two or three times. JAMES BANKIER—p. 114 *et seq.*, *op. cit*, p. 637, *supra*—did so also, although he naively writes: "If dysentery, however, goes on, independent of three or four bleedings employed early in the attack, then I question very much if any good can result from the prosecution of the practice"—p. 126, *op. cit.* According to EWART—p. 356 *et seq.*, *op. cit.*, last page—J. MOUAT, (1831,) WALTER RALEIGH, (1834,) W. A. GREEN, (1837-40,) HUNTER, (1838,) JAMES BIRD (1839) and H. H. GOODEVE, (1842,) all bled with more or less freedom in Indian dysentery. PARKES—*Dysentery and Hepatitis of India*, London, 1846, p. 139—wrote: "For the purpose of subduing the inflammation, depletion is indispensably necessary in Europeans, and is indeed inculcated by all sound writers on the subject;" and again: "I cannot forbear again insisting upon the great importance of free depletion, general or local, according to the judgment of the physician, in the common acute tropical dysentery." Bloodletting, very much as practiced by ANNESLEY, is also still recommended by MOREHEAD—p. 293, *op. cit.*, p. 657, *supra*—and Sir JAMES RANALD MARTIN—p. 458, *op. cit.*, p. 621, *supra*. On the other hand, Professor W. C. MACLEAN—Vol. I, p. 120, *op. cit.*, p. 657, *supra*—assures us that at the time he wrote, bleeding, whether general or local, was almost entirely superseded in India by the ipecacuanha treatment, and AITKEN has added his testimony to the same effect; see note ‡, next page. Of the fact of the disuse of bleeding there can be no doubt, but I question the explanation offered.

‖ Among these I may mention NAUMANN—Bd. IV, Abth. 2, S. 94, *op. cit.*, p. 645, *supra;* VOGT—S. 171, *op. cit.*, p. 645, *supra;* COPLAND—*Dict. of Pract. Med.*, Vol. I, London, 1858, p. 717; and GEORGE B. WOOD—Vol. I, p. 719, *op. cit.*, p. 671, *supra*. The latter author expresses, as late as 1866, what had long been regarded as the conservative view on this subject: "Bleeding is not necessary in all cases of dysentery, and, in the adynamic form of the disease, may be injurious. It should, however, always be resorted to when there is much pain and tenderness of the abdomen, with febrile action and a vigorous pulse."

Wurtemburg epidemic convinced Hauff that the operation was seldom needed. Baly came to the same conclusion in the course of the epidemic at the Milbank penitentiary. Bamberger protested that he never had the courage to bleed during the Prague epidemic. Neither Trousseau nor Niemeyer so much as mention venesection in the account of the treatment of dysentery given in their text-books.* Savignac has declared that it is not indicated, and has drawn a deplorable picture of the consequences he witnessed at the beginning of his practice from the freedom with which it was then generally employed.† At present, as Heubner correctly states, venesection in this disease is universally abandoned; but it is erroneous to suppose, with Aitken, that this fortunate result is due to the revival of the use of ipecacuanha.‡ It is rather the result of the general reform which has led modern physicians to abandon this operation in the treatment of all inflammatory diseases. I may add that the new views had already been widely adopted in the United States before the commencement of our civil war, during the progress of which I did not hear of a single case in which venesection was resorted to in dysentery.§

One of the most distinguished medical writers in the United States has recently made an eloquent appeal in favor of the revival of bloodletting as a therapeutic agent.‖ A discussion of the general merits of such a proposal would be out of place here, but whatever its fortune, the hope may be expressed that no reaction will ever restore this operation to a place in the therapeutics of dysentery.

LOCAL BLOODLETTING.—The local abstraction of blood by means of cups was already practiced in the time of Hippocrates, and Galen discussed the employment of cups and leeches in a special treatise. It does not appear, however, that either of these physicians resorted to local bloodletting in the treatment of the alvine fluxes, and most of the other Greeks are equally silent on this head.¶ Themison, indeed, who has the credit of being

* HAUFF—S. 424, *op. cit.*, p. 534, *supra:* "Besonders wurde in der letzten Epidemie nach meiner eigenen und nach Anderer Erfahrung der Aderlass sehr selten und nur in der ausgebildet entzündlichen Form ertragen." Compare BALY—p. 535, *op. cit.*, p. 535, *supra.* BAMBERGER—S. 414, *op. cit.*, p. 578, *supra*—remarks: "Es fehlt mir an ausreichenden eigenen Erfahrungen über diese Methode, die selbst zu versuchen ich nicht den Muth hätte;" and he points out how vain it is to hope to limit exudative or ulcerative processes in the intestinal organs by the abstraction of blood. TROUSSEAU—T. III, p. 166 *et seq.*, *op. cit.*, p. 664, *supra.* NIEMEYER—Bd. II, S. 754 *et seq.*, *op. cit.*, p. 645, *supra.*

† SAVIGNAC—p. 331, *op. cit.*, p. 620, *supra:* "J'ai assisté, au début de ma carrière, aux derniers expériments de cette thérapeutique sanglante qu'ouvrait les veines et lacérait la peau sous le moindre prétexte; * * * Les résultats étaient déplorables; les anhémies consécutives, les hydropisies, les cachexies étaient nombreuses, la chronicité plus fréquente, plus incurable," &c. HASPEL—T. II, p. 109 *et seq.*, *op. cit.*, p. 621, *supra*—has given a graphic account of the manner in which his Algerine experience compelled him to abandon bloodletting in dysentery, at the close of which he exclaims: "D'ailleurs par la saignée qu'allez-vous obtenir? Un état de faiblesse, de débilité générales! est-ce ainsi que vous pensez guérir en procédant comme la maladie? Non, plus le malade s'affaiblit, plus le mal grandit; l'expérience de chaque jour le démontre."

‡ HEUBNER—S. 543, *op. cit.*, p. 529, *supra:* "Der Aderlass, früher (von Sydenham, Broussais u. A.) viel angewandt, wird jetzt mit Recht vollständig vermieden." AITKEN—Vol. II, p. 659, *op. cit.*, p. 647, *supra:* "Bloodletting has now been totally superseded and rendered unnecessary by the use of ipecacuanha." But ipecacuanha was used with equal freedom in the latter part of the seventeenth and during the eighteenth century, even by those who bled extravagantly, as we will see hereafter.

§ In this connection I must commend the prudent remarks of STILLÉ—p. 363, *op. cit.*, p. 650, *supra*—which were doubtless not without influence upon our medical officers. He declares that under the use of antiphlogistic measures in dysentery "the strength is very apt to fail suddenly, and the disease to assume a low asthenic type. * * * Hence the apparently clear indication for venesection in the necessity of allaying the general violence of action and the local distress is calculated only to mislead, as it has done many physicians who afterward abandoned it as mischievous."

‖ S. D. GROSS—*A discourse on bloodletting considered as a therapeutic agent*, Trans. of the Amer. Med. Ass., Vol. XXVI, 1875, p. 419. In this address bloodletting is deplored as "one of the lost arts." The author declares that for nearly two thousand years it was regarded by the most eminent and enlightened men as essential to success in the treatment of disease. But the historical sketch just presented shows that this remark does not apply to the use of the operation in dysentery. Our modern practice in this disease is in harmony with that of the greatest of the Greek physicians, and is supported by the testimony of some of the best observers in every age. I cannot therefore believe that in this disease "bleeding will again come into fashion," p. 432.

¶ Both dry and wet cups are referred to in several passages in the Hippocratic writings; *e. g.*, in *De Medico*, § 7, [Ed. Littré, IX. p. 213,] both are described; wet cups in *De Morb. Intern.*, § 21, [*Id.*, VII, p. 221;] and dry cups in *Aphor.*, Sect. V, 50, [*Id.*, IV, p. 551.] The medical use of leeches is not referred to, although in *Prædict.*, Lib. II, § 17, [*Id.*, IX. p. 43,] the symptoms of a leech accidentally adhering in the throat are described. DIOSCORIDES—Lib. VI, Cap. XXXII, fol. 331, Ed. cited p. 623, *supra*—has a chapter on leeches, in which he describes the accidents to be apprehended from swallowing them with the drinking water, and gives details with regard to the treatment, but does not mention the use of leeches for medical purposes. According to CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. I, Cap. 1, p. 285, Ed. cited p. 664, *supra*—the first to make use of leeches in the treatment of chronic diseases was THEMISON. This passage has been generally, and perhaps correctly, interpreted to mean that he was the first to employ them for any medical purpose; see, *e. g.*, SPRENGEL—Bd. II, S. 32, *op. cit.*, p. 346, *supra.* In the treatise of GALEN—*De Hirudinibus, Revulsione, Cucurbitula, Incisione et Scarificatione*, [Ed. Kühn, XI. p. 317,]—leeches are spoken of as a convenient substitute for cups. Their employment is also discussed by ORIBASE—*Collect. Med.*, Lib.

the first to employ leeches to abstract blood for medical purposes, is said to have applied them to the nostrils, ears and angles of the eyes of dysenterics; but Cælius Aurelianus, who reports this practice, criticises it as useless.* So, too, the application of both cups and leeches to the abdomen of patients suffering with the cœliac flux was directed by Aretæus, but only in case inflammation or distention should occur about the liver or stomach.† These are the only references to the use of local bloodletting in the treatment of the alvine fluxes that I have been able to find in the writings of the Greek physicians.

The Arabians used both cups and leeches more freely than the Greeks, and wrote at length on these methods of local depletion;‡ I find, however, no satisfactory evidence that they ever used leeches in diarrhœa or dysentery. The application, in certain cases of the latter disease, of wet cups over the sacrum, in the vicinity of the anus, or to the calves of the legs, is commended in the writings of Haly Abbas and Albucasis;§ but the Arabian physicians hesitated to affix wet cups to so tender a region as the abdomen, to which, however, they applied dry cups liberally in several forms of alvine flux; a practice especially commended by Avicenna.‖

It is difficult from the records in our possession to form any precise notion of the extent to which local bloodletting was actually employed in the treatment of the fluxes prior to the invention of printing, yet the doctrine so clearly expressed by Celsus, that wet cups may advantageously be substituted whenever the strength of the patient is insufficient to support venesection,¶ must have suggested at least the occasional employment of these local measures in the dysentery of children or feeble adults. Certainly we find this the general practice in the sixteenth century, as may be seen in the works of Altomarus and Nicolaus Piso.**

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VII, Cap. 21 and 22, Œuvres, (Bussemaker et Daremberg.) T. II, Paris, 1854, p. 69 *et seq.*—in extracts borrowed from ANTYLLUS and MENEMACHUS, but he does not mention their use in the alvine fluxes. The same remark applies to his account of cups—*op. cit.*, Cap. 16-20, T. II, p. 58 *et seq.*—borrowed from various sources, and to the account of cups in the works of ÆTIUS—Tetrab. I, Serm. 3, Cap. 20, Lyons, 1549, p. 146—and PAULUS ÆGINETA—Lib. VI, Cap. 41, Vol. II, p. 324, Ed. cited p. 624, *supra*. ALEXANDER OF TRALLES is silent with regard to the use of either of these measures in the treatment of the fluxes, and the Roman writer, CELSUS, is likewise silent.

* CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 6, p. 527, Ed. cited p. 664, *supra*.

† ARETÆUS—*De Cur. Morb. Diut.*, Lib. I, Cap. 7, Boerhaave's Ed., Leyden, 1731, p. 132: "And if there be distention or inflammation anywhere about the liver or mouth of the stomach, we are to apply the cupping instrument and scarify; and there are cases in which this alone is sufficient. But when, by means of cerates, the wounds have cicatrized and ended in hardness, we are to apply leeches."

‡ See, for example, on the subject of cupping and leeching, RHAZES—*Ad Mansor. De Re Med.*, Lib. VII, Cap. 22, De Cucurbitulis, Cap. 23, De Hyrudinibus, pp. 178 and 179, Ed. cited p. 678, *supra;* HALY ABBAS—*Pract.*, Lib. IX, Cap. 8, fol. 275, Ed. cited p. 678, *supra;* AVICENNA—Lib. I, Fen 4, Doct. 5, Cap. 21, De Ventosis, Cap. 22, De Sanguisugis, p. 225, Ed. cited p. 632, *supra;* ALBUCASIS—*De Chirurgia*, Lib. II, § 96, De Cucurbitulis, § 97, De Hirudinum Affixione, Oxford Ed., 1778, p. 491 *et seq.*

§ HALY ABBAS—*loc. cit.*—directs that wet cups (sitia cum incisione) be applied between the buttocks, (inter anchas,) *i. e.*, I suppose, over the sacrum, in tenesmus from inflammation of the lower bowel, (tenasmon apostemati,) and at the anus (super anum) in cases of pain or a sense of burning of that part, or of pain in the bowels. According to ALBUCASIS—p. 495, *op. cit.*, last note—a single large cup applied with free scarification (scarificet scarificatione magna) over the os coccygis is advantageous in case of ulcers of the lower bowels, (ulcera inferiora;) he adds that cups applied to both legs (to the calves?) diminish plethora in a striking manner, because they attract blood from the whole body; and in a passage, that does not exist in all the manuscripts, that this is advantageous in a flux of blood proceeding from dysentery; that the cups should be large, well scarified, and that strong suction should be used.

‖ The writers enumerated in note ‡ specify the various parts to which wet cups may be applied, among which none of them mention the abdomen. ALBUCASIS—p. 501, *op. cit.*—expressly directs that dry cups only (cucurbitulæ sine scarificatione) should be employed over the liver, the spleen, the umbilicus and other parts of the belly, &c., because wet cups are not well borne by these parts, (hæc etenim membra, in ea scarificationem non ferunt.) With regard to the application of dry cups in the treatment of the fluxes, see RHAZES—*Divisionum*, Lib. I, Cap. 67, p. 390, *op. cit.*, note ‡, *supra*—who recommends their application over the spleen (positio ventosarum cum igne super splenem) in the flux from black bile, and AVICENNA—Lib. III, Fen 16, Tract. 2, Cap. 5, p. 821, *op. cit.*, note ‡, *supra*. The latter author elsewhere—Lib. III, Fen 16, Tract. I, Cap. 4, p. 816, *op. cit.*—strongly commends the application of dry cups to the belly in fluxes due to excoriation of the intestines, saying that he has known this treatment to cure the disease within four hours: "Et ex retinentibus fluxum ventris, est positio ventosarum super ventrem; jam enim expertum est, quod ventosæ positæ super ventrem eorum, qui habent fluxum ventris, et excoriationem quum dimittuntur quatuor horis, restringunt et nos jam experti sumus illud."

¶ CELSUS—Lib. II, Cap. 11, Vol. I, p. 107, Ed. cited p. 656, *supra:* "Opus etiam esse cucurbitula potest in morbis longis, quamvis et iis jam spatium aliquod necessit; sive corrupta materia, sive spiritu male habente: in neutis quoque quibusdam, si et levari corpus debet, et ex vena sanguinem mitti vires non patiuntur. Idque auxilium ut minus vehemens, ita magis tutum," &c.

** DONATUS ANTONIUS AB ALTOMARI—*loc. cit.*, p. 680, *supra*—after laying down the rules for bleeding in the early stages of dysentery quite in accordance with the teachings of ÆTIUS and ALEXANDER OF TRALLES, ("prout Ætius, et Alexander probarunt,") adds that it is preferable to apply leeches to the arm in the case of children under eleven years old or to draw blood with cups, remarking: "Nam licet eis sanguis mittendus sit, si ea adsint, quæ supra notavimus, tamen iis non per venæ sectionem, sed per hirudines, aut cucurbitulas, extrahi debet." He does not state where the cups were to be applied, but this is clearly stated by NICOLAUS PISO—Lib. III, Cap. 15, p. 275, *op cit.*, p. 665, *supra*—who, under the same circumstances, directs that blood be drawn by leeches applied to the arms, or cups to the buttocks or the shoulders: "Quod si ætas reluctetur, per hirudines admotas cubito, vel cucurbitulas clunibus et omoplatis adhibitas sanguis extrahatur."

According to these writers, leeches should preferably be applied to the arms, cups to the scapulæ or the buttocks. Fabricius Hildanus and Sennertus* employed the same method, but after Botallus and Sydenham† had popularized free venesection in the treatment of dysentery cups and leeches appear to have been very generally discarded as inefficient.‡ No mention is made of their employment in this disease by Pringle, Monro, Mosely or Cullen; and the majority of writers on dysentery, until the commencement of the present century, are equally silent.

When the use of cups and leeches in dysentery was again revived they were employed not merely as a substitute for venesection, but also as an additional means of depletion. The Arabian prejudice against applying wet cups to the abdomen no longer exercised any restraining influence, and this brutal mode of depletion, commended by various writers from Fournier and Vaidy to Barrallier, has been extensively used.§ I am sorry to say that it was resorted to by a few of our own medical officers during the civil war.‖ The application of wet cups to the sacral region, when pain in that part is complained of, or when rectal or vesical tenesmus is urgent, has also been approved by some physicians.¶ But, on the whole, during the present century preference has been given to leeches as a means of local bloodletting in dysentery, and cups have generally been employed only when economy was an object, or when leeches were difficult to obtain.

The application of leeches to the anus, proposed by Buchner in the early part of the last century, and approved by Pinel towards its close, was extravagantly praised by Broussais,** and came subsequently into very general use, especially in France. This plan has been commended by many modern writers, among others by Savignac, and quite recently by Heubner.†† It has been claimed that the congested circulation of the mucous membrane of the large intestine can in this way be directly depleted, which, in view of the anatomy

* FABRICIUS HILDANUS—Cap. 8, p. 684, *op. cit.*, p. 644, *supra*—remarks in the same connection: "In the case of children who, on account of their age, ought not to be bled, the arm should be tied up so as to make the veins somewhat prominent, then one or two leeches should be applied over a vein. In the case of the young, the old, and in all for whom the use of venesection may be doubtful, cups may be applied over the scapulæ for the sake of revulsion. At first they may be put on a few times without scarification; afterwards with scarification." SENNERTUS—T. III, p. 131, *op. cit.*, p. 645, *supra*—in the same spirit remarks: "If aught should prohibit venesection, cups with scarification should be applied to the scapulæ." He does not, however, mention the use of leeches in this connection.

† See p. 681, *supra*.

‡ Long before, CELSUS—*loc. cit.*, last page—had remarked, with regard to cups: "Cum eo tamen, ut scimus, hic ut nullum periculum, ita levius præsidium esse."

§ FOURNIER et VAIDY—p. 292, *op. cit.*, p. 362, *supra*: "Les saignées locales faites, soit au moyen des sangsues posées à l'anus, soit par des ventouses appliquées sur l'abdomen, et scarifiées, sont souvent d'un grand avantage;" that is in the treatment of inflammatory dysentery. BARRALLIER—p. 760, *op. cit.*, p. 603, *supra*: "Dans les pays tempérés, quand les sujets ne sont pas trop debilités ou quand la maladie est recente, les saignées locales par les sangsues ou par les ventouses peuvent être prescrites dans la complication inflammatoire, pour combattre les douleurs abdominales particulières." SAVIGNAC—p. 332, *op. cit.*, p. 620, *supra*—tells us that in his younger days it was common to see wet cups applied by the fifteen or twenty at a time to the abdomen; but the just censure which he bestows upon this method does not prevent him from advising on the very next page the application of from four to six wet cups over the course of the colon or in either iliac fossa, if the case is of a well marked inflammatory character or the tenesmus resists treatment. He declares that he prefers them to leeches.

‖ See, in Section II, the remarks of JONES—p. 85, *supra*—who declares that he never omitted the application of wet cups to the abdomen, "when the case assumed an aspect at all threatening," and that they were "uniformly beneficial;" and TAYLOR—p. 87, *supra*—who recommended "wet cupping upon that portion of the abdomen where pressure caused the most pain" in the treatment of "ordinary cases" of dysenteric diarrhœa. I have no reason to believe that this practice was resorted to by any considerable number of our medical officers.

¶ Thus COPLAND—*loc. cit.*, p. 682, *supra*—directs: "If tenesmus or dysuria be urgent, and pain be felt along the sacrum, the leeches may be placed there or on the perinæum, or cupping on these parts may be directed."

** FELIX PLATER—*loc. cit.*, p. 680, *supra*—had noticed that spontaneous bleeding from pre-existing hæmorrhoids sometimes afforded considerable relief in dysentery, but, so far as I know, BUCHNER—*Miscell. Med. Phys. Mathemat.*, 1728, p. 1035; I have not seen this work, and cite from DE SEE, p. 186, *op. cit.*, p. 625, *supra*—was the first to use leeches for the same purpose. According to DE SEE he employed them with great success in epidemic dysentery when the tenesmus was severe and persisted in spite of other medication. PINEL—T. II, p. 335, *op. cit.*, p. 635, *supra*—chiefly advised leeches to the anus in cases of dysentery complicated by suppression of an habitual hæmorrhoidal flux or of the menstrual secretion. BROUSSAIS—T. III, p. 14, note, *op. cit.*, p. 633, *supra*—declared that in the first stage of dysentery when there is violent tenesmus and no feculent matters in the dejections leeches applied to the anus relieve the disease in an almost miraculous manner. He did not however, limit their application to this point but would put them also over the cæcum, the epigastrium or any point along the course of the colon that might be painful. See notes to pp. 238 and 239, *supra*, vol.

†† SAVIGNAC—*loc. cit.*, note §, *supra*—regards leeches applied to the anus as perhaps even more useful than his favorite cups applied to the abdomen. He adds: "Ce moyen paraît avoir plus d'action sur l'inflammation de l'intestin, et il serait particulièrement indiqué dans le cas où l'intensité du ténesme et des épreintes l'emporterait sur celle des douleurs abdominales." HEUBNER—S. 543, *op. cit.*, p. 529, *supra*: "Besser ist die Blutentziehung am After, hier entleert man Gefässe, die mit denjenigen der erkrankten Schleimhaut in directem Connex stehen." He therefore advises the application, at the beginning of the disease, of 10 to 20 leeches around the anus.

of the parts, it is evident cannot possibly be effected by abstracting blood from the abdominal parietes. Certainly, if it is ever necessary or desirable to resort to local bloodletting in dysentery, this method might be expected to prove most advantageous; nevertheless, as Vogt has justly remarked, experience shows that the general course of the disease cannot thus be perceptibly modified, and the fetid discharges from the bowels are apt to contaminate the leech bites around the anus and convert them into ugly sores.*

Various other parts have been selected for the application of leeches in dysentery, such as the sacral region, the upper part of the inner surface of the thighs and the lumbar region; this latter was preferred by Vignes,† under the delusion that he could thus deplete from the intestines through the mesentery; but the general practice has been to apply them directly to the surface of the abdomen. Here some, with Hauff and Naumann,‡ have selected the course of the large intestine; others, with Twining,§ the part most sensitive to pressure, wherever that may be. Both Annesley and Twining‖ used them to secure further depletion after the employment of venesection as well as in cases where general bloodletting was contraindicated, and this practice was adopted by many later Indian physicians as well as by some of the best European practitioners. The prevalent belief in the efficacy of bloodletting in inflammation encouraged not a few to go to dangerous extremes, both in applying great numbers of leeches and in permitting subsequent hæmorrhage from the bites. Cheyne declared in 1822 that he had known patients to die from such hæmorrhages; and Savignac,¶ writing of a much later period, testified that he had seen forty, sixty, even a hundred leeches applied to the belly at a time. Such wanton extravagances have disappeared from practice since the abandonment of bloodletting, but the application of a moderate number of leeches, in case the tormina are severe, or if there is much tenderness on pressure, continues to find favor in many quarters. Even so prudent a physician as Niemeyer commends this practice; nay, he goes further and sanctions subsequent warm applications to favor hæmorrhage from the bites.**

Is this practice necessary or justifiable? I cannot think so. If a sufficient quantity of blood be drawn in this way to produce any constitutional impression, it can only diminish the natural powers of resistance and thus indirectly add to the dangers of the disease. If less be taken, no beneficial modification of the inflammation is produced; and any temporary relief from pain that can be thus obtained might with less inconvenience be secured by morphia, administered hypodermically, or other unobjectionable means. Bamberger, who more than twenty years ago expressed substantially these views, nevertheless admitted the propriety of local bloodletting in case the symptoms clearly indicated the existence of local peritonitis; and Heubner†† has recently expressed the same opinion. I cannot, however,

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* VOGT—S. 174, *op. cit.*, p. 645, *supra*. He admits, however, that the tenesmus is more likely to be relieved in this way than by the abstraction of blood, even in greater quantity, from other parts. BAMBERGER—S. 414, *op. cit.*, p. 578, *supra*—asserts, however, that the tenesmus can be still more effectually relieved by the use of narcotics; in which he is undoubtedly right.

† This application to the sacral region is mentioned by COPLAND—*loc. cit.*, last page; see also VIGNES—*loc. cit.*, p. 682, *supra*—who applied leeches both to the thighs and the lumbar region; his reasons for preferring the latter situation are given in a foot note.

‡ HAUFF—S. 442, *op. cit.*, p. 534, *supra*—advised leeches only in inflammatory dysentery to be applied to the most painful part of the abdomen, "which as a rule will be the region of the descending colon." NAUMANN—Bd. IV, Abth. 2, S. 95, *op. cit.*, p. 645, *supra*—indicated as preferable the region of the cæcum and of the descending colon.

§ TWINING—Vol. I, p. 70, *op. cit.*, p. 608, *supra*. ‖ ANNESLEY—Vol. II, p. 273, *op. cit.*, p. 621, *supra*. TWINING—see last note.

¶ J. CHEYNE—*Med. report of the Whitworth Hospital, House of Industry, &c.*, The Dublin Hospital Reports, Vol. III, 1822, p. 47: "But it must be observed that the effusion of blood after leeches applied to the abdomen, when the patient is exhausted, ought to be watched: I have known patients when neglected, sink in consequence of this effusion, who would have borne a moderate bleeding well." SAVIGNAC—*loc. cit.*, p. 683, *supra*.

** NIEMEYER—Bd. II, S. 755, *op. cit.*, p. 645, *supra*. This treatment he declares is most serviceable, ("leistet vorzügliche Dienste.")

†† BAMBERGER—*loc. cit.*, note *, *supra*: "Nur bei localen umschriebenen Entzündungen des Bauchfellüberzugs bringen, wie diess oben angedeutet wurde, örtliche Blutentziehungen häufig Erleichterung." So, also, HEUBNER—*loc. cit.*, last page—says of local bloodletting applied to the abdomen: "Man hat sie deshalb auf die Fälle excessiver Schmerzen und peritonitischer Erscheinungen zu beschränken."

admit that this complication offers any peculiarities to justify such treatment. No more in this than in other inflammations is any considerable loss of blood aught but injurious; no more than in others is a more moderate abstraction aught but inefficient. I am fully in accord with those who, like Bauer,* have of late counselled that in peritonitis, whether general or circumscribed, local as well as general bloodletting should be abandoned, for it is a delusion to imagine that we can by their means either check or modify for the better the course of the disease.

MEDICATION BY THE MOUTH.—For the cure of the alvine fluxes physicians have employed an immense variety of medicaments which may, however, be conveniently grouped under a few general heads. Changes of opinion with regard to the pathology of these diseases have by no means been always accompanied by radical modifications of the therapeutical measures adopted, some of which are still found practically useful after having been employed on various theoretical grounds for more than two thousand years. This statement is well illustrated by the history of the treatment of dysentery. So long as the humoral pathology maintained its sway there could be no doubt as to the indications;† the acrid humors, regarded as the cause, should be evacuated from the alimentary canal by purgatives and emetics, from the blood by diaphoretics and diuretics; meanwhile their injurious action upon the intestines should be moderated by the administration of diluents and emollients, or the mucous membrane protected by glutinous and oily substances; the

* BAUER—*Krankheiten des Peritonæums*, Ziemssen's Handb., Bd. VIII, 2, S. 335—after stating that the approved treatment of peritonitis consisted in venesection, the application of leeches to the part, inunctions with mercurial ointment, sometimes to salivation, and the internal administration of calomel, adds: "I must avow that I have not been able to recognize any demonstrable success from these things; that on the contrary the free abstraction of blood from the abdomen by 50 or more leeches must produce an injurious effect on the circulation. At most it may be claimed for a smaller number of leeches (15–20) that the subjective sensations are improved without any injurious consequence resulting. But I believe that in most cases the practitioner may omit local bloodletting without being guilty of neglect." In striking contrast with these temperate views are those expressed in a recently published lecture by my friend H. C. WOOD, JR.—*The heroic treatment of idiopathic peritonitis*, The Boston Med. and Surg. Jour., Vol. XCVIII, 1878, p. 466: "I remember my uncle, Dr. George B. Wood, saying that he never lost a case of peritonitis in an adult, and the reason he gave was that he always bled his patients from the arm until they fainted, and then put one hundred leeches on the abdomen. I am proud to say that I am a thorough believer in the same plan of treatment, antiquated as it may appear. * * * I have never, you see, had cause to regret having bled my patients copiously. It makes very little difference whether you take the blood from the arm or from the abdomen, provided you draw enough to make a profound impression. * * * What is to be done after venesection? I take my stand on the old theory that calomel has power to modify inflammatory action. * * * I am, as you see, a most entire believer in the antiphlogistic properties of calomel,—not indeed in inflammations where there is too little fibrine, but in all inflammations where it is in excess. As peritonitis is an exceedingly severe disease, and means death in ninety-nine out of a hundred cases unless they are treated promptly and efficiently, mercury, to do any good, must be taken in decided doses. In my fifth case, referred to above, I gave half a grain of calomel every hour. In this case I am giving one quarter of a grain every hour. In connection with the calomel opium is undeniably of great value. * * * The ability to stand large doses of opium in peritonitis is wonderful. In one of my cases *seventy-five* grains of solid opium were taken daily for five days, and the patient made an excellent recovery. * * * After the abdomen has been thoroughly poulticed for two or three days blisters may be used, provided the temperature of the body has not remained high; that is, a blister may be applied at the end of three days if the temperature has fallen in the mean while. Do not put on a small blister. I was talking with my uncle, Dr. George B. Wood, the other evening about this very case and he said that if he were in my place he would order a blister ten by ten (inches). I have ordered a blister eight by ten." Is such treatment wise? Is it true that bleeding, followed by calomel and opium in large doses, cures peritoneal inflammation? If so, why not all other inflammations, including those that follow surgical injuries? Are we to throw away all the experience of the last twenty years in this direction? Shall we not rather regard this plan of treatment recommended in this lecture as a relic of the past, no more to be accepted than the statement that peritonitis "means death in ninety-nine out of a hundred cases unless they are treated promptly and efficiently"?

† I will not pause here to collect the indications insisted upon by the ancients, which will be sufficiently shown further on in connection with the several groups of remedies, but cite, in illustration of those recognized by the more modern humoralists, FELIX PLATER—p. [illegible] *op. cit.*, p. 683, *supra*—according to whom the objects to be attained in the treatment of all the alvine fluxes are: 1, To remove the cause, whether it is to be found in bile or other morbid humor, in eroding medicaments or in poisons; this is to be effected by evacuants and abstergents. 2, To diminish the violence of irritation by lenitives, anodynes, stupefaciants and antidotes, and, if inflammation be also present, to use refrigerants. 3, To endeavor to heal the excoriations and ulcers, which constitute the disease, by drying remedies, and especially to use astringents, which not merely have this effect but also check the flux. LAU. HILDANUS—p. 675, *op. cit.*, p. 644, *supra*, writes: "The chief points in the treatment of dysentery are that the acrid and malignant humors should be evacuated, and the ulceration and excoriation healed. Meanwhile, as Galen admonishes, attention should always be paid to the condition of the liver. GALEN—*Comm. IV in Hippoc. de Artic Lib.*, Cap. 39, [Ed. Kühn, XVIII, A, p. 730.]) That this may be effected four indications (intentiones) should be observed: 1, That a proper regimen should be adopted; 2, that acrid and malignant humors should be purged away and evacuated; 3, that the pains should be mitigated; and 4, that the flux should be checked and the ulcers healed." SENNERTUS—T. III, p. 131, *op. cit.*, p. 645, *supra*—remarks that in the treatment of dysentery the indication is to heal the abraded or ulcerated intestine; but that since this cannot be done unless the cause of the trouble, viz., the abrading, eroding humor should be evacuated and abstergent, at the same time its acrimony mitigated and corrected, other causes should be prevented from flowing to the intestines, by revulsion and derivation; the flux should be checked by astringents, and the pain, if vehement, should be removed. In like manner, too, BOERHAAVE wrote—*Aphorismi*, (1709,) § 722, Nuremburg, 1747, p. 159: "Sanatio absolvitur acris irritantis [illegible] per emetica, purgantia, clysmata; corroborantiene laxi; pacatione impetus per narcotica; determinatione aliorsum per sudores, urinasve, absolutis [illegible] morbosæ, correctio ejus fonte primo;" on which see the learned commentary of VAN SWIETEN—T. II, p. 387, *op. cit.*, p. 663, *supra*—in which the judicious reader will find much worthy of reflection.

pain should be controlled by anodynes, and after the evacuation of the morbid humors the flux should be checked by astringents and the strength sustained by corroborants. But substantially these very measures continued to be resorted to by those who announced that the efforts of the physician ought chiefly to be directed to the cure of the inflammation of the intestinal mucous membrane, and they are still resorted to with but little modification by those modern practitioners who, like Niemeyer, declare that it is vain to attempt to meet any *indicatio causalis* or *indicatio morbi*, and that all we can do is to endeavor to fulfil the *indicatio symptomatica*.*

Much briefer has been the popularity of the various remedies supposed to possess specific virtues, which from time to time have enjoyed temporary favor, but presently fallen into disuse, to be replaced by others. Most of these belong to the groups of therapeutic agents just indicated, or are compounded by combining articles belonging to several of them; some, however, are derived from other classes of drugs. It cannot be said that any of them actually deserve the reputation they have enjoyed. The same remark applies to the various plans which have been suggested for jugulating or aborting acute dysentery at its onset.† No more in this than in other acute inflammations are we so fortunate as to have means that really possess any such power.

In determining upon the plan of treatment for any particular case of flux it should be borne in mind that the acute forms, including even diphtheritic dysentery, are, under favorable circumstances, like other inflammations, self-limited as to duration, and tend towards recovery. This latter tendency exists also to a greater or less extent in the chronic cases, except when some fatal constitutional complication coexists, or after an actual destruction of the intestinal mucous membrane to an extent incompatible with recovery has already occurred. A system of therapeutics directed merely by the indications afforded by the symptoms will often lead to the adoption of inefficient or even of dangerous medication: much rather should the practitioner always endeavor to recognize the pathological conditions actually existing in each case, and consider the probable effects of any proposed plan of treatment upon these conditions, selecting only those remedies which are favorable to the natural tendency to resolution, and rejecting all those which could have the effect of aggravating the lesions present. Already the Greek physicians endeavored to regulate their treatment of the fluxes in accordance with the part of the intestine affected and the character of the local process.‡ Whatever want of success attended this effort was due to the imperfect pathological knowledge upon which their diagnosis of the local condition was

* NIEMEYER—Bd. II, S. 755, *op. cit.*, p. 645, *supra*.

† Or, as the Germans call it, "Abschneidungskur." See VOGT—S. 163, *et seq.*, *op. cit.*, p. 645, *supra*—who enumerated under this head attempts to cut the disease short by large doses of ipecacuanha; by free purgation, especially with large doses of calomel; by combinations of calomel and ipecacuanha, both in large doses; and by free diaphoresis produced by the warm bath and covering the patient with many bed clothes, as well as by the administration of diaphoretics, hot drinks, &c. Compare BAMBERGER—S. 413, *op. cit.*, p. 578, *supra*—who speaks of such measures under the heading "Abortivemethode," enumerating energetic diaphoretic measures, emetics and large doses of calomel as having been resorted to.

‡ Thus the Greek physicians attached great importance to the symptoms by which they hoped to diagnosticate between abrasion and ulceration of the small intestine and of the large: see note †, p. 362, *supra*, for details. In the first case they advised that remedies should be administered by the mouth; in the second case by enemata. Again, in the Hippocratic writings it is clearly indicated that the diluent and mild astringent drinks, which answer well enough for simple (catarrhal) dysentery, are inadequate for the treatment of the severer (diphtheritic) cases in which pseudomembranes and sloughs (*ξυσματα*) occur in the stools; in this grave form of the disease purgation should first be resorted to—see Aph. VII, 69, [HIPPOCRATIS *Opera*, Ed. Kühn, III, p. 765:] "Et quibus dejectiones, si residere permiseris neque moveris, veluti strigmenta subsident, *et si paucæ sunt, parvus est morbus, sin vero multæ, magnus*, iis alvum infra purgari conducit. Quod si minime purgata alvo sorbitiones exhibueris, quo plures dederis, eo magis nocebis." GALEN, in his commentary on this passage, [Ed. Kühn, XVIII, A, p. 182,] holds that the text is probably corrupted, and asserts that it is by no means always necessary to purge if *ξυσματα* are present in the stools; in fact, as will be shown hereafter, he objected in a general way to purgation in dysentery. LITTRÉ [IV, p. 601] omits the passage I have italicized in the Hippocratic aphorism, chiefly on account of its absence from an ancient manuscript, (which he designates C.) but he correctly remarks that the same idea is expressed in aphorism VII, 81, as to the authenticity of which he has no doubt; it will also be found in the treatise *De Judicationibus*, § 32, [Ed. Littré, IX, p. 287,] so that there can be no doubt of the importance attached in the Hippocratic times to the presence or absence of *ξυσματα* in the stools. Now that we better understand the nature of these substances, their diagnostic value is still greater, and modern physicians would do well to imitate HIPPOCRATES in attention to the characters of the stools.

founded. A similar attempt ought to be attended with better fortune at the present time, when we possess so many aids to accurate diagnosis which were quite unknown to them. This purpose, therefore, will be kept in view in the course of the remarks about to be offered with regard to particular medicaments.

EMETICS.—The virtues of white hellebore, administered as a phlegmagogue emetic in the early stages of dysentery, are extolled in the Hippocratic writings.* Galen administered emetics in dysentery to evacuate peccant humors accumulated in the stomach, and as revulsives when the lower bowels were ulcerated, or in chronic diarrhœa.† Archigenes employed them for similar reasons in the cœliac flux, and affirms that they serve to restore the normal functions of the digestive organs.‡ The usefulness of revulsion thus produced, in the treatment of the alvine fluxes, is commended in the Canon of Avicenna.§ Altomarus, Amatus Lusitanus, Fab. Hildanus, Riverius and Rolfincius employed emetics in the early stages of dysentery,‖ but we learn from Forestus that the physicians of his times were divided in opinion as to their use; he himself held that if the patient could readily be vomited, if his stomach were not very weak, and he had no great loathing for food, mild emetics are advantageous.¶ Felix Plater limited the exhibition of emetics to cases in which the stomach contained morbid humors or poisons, and Sennertus strenuously advised that they should be used only in the latter case.** Meanwhile, however, two drugs came into use which subsequently acquired great renown as specifics, and may conveniently be considered in this place, although the advocates of each have strenuously denied that its virtues in this disease are due to its emetic action: I refer to antimony and ipecacuanha.

*Antimony*, which had been lauded by the alchymist Basil Valentine as a cure-all, was almost equally extolled by Paracelsus, who invented a nostrum in which it was the most potent ingredient for the cure of desperate cases of dysentery.†† The Paracelsists and iatro-chemists used a great variety of antimonial preparations in this disease, both as specifics and on account of their energetic diaphoretic action, while Sylvius claimed for them peculiar alterative powers as well as unequalled virtues in evacuating bile, phlegm

* See the account of the treatment of dysentery in the Hippocratic treatise *De Affectionibus*, § 23, [Ed. Littré, VI, p. 235:] "After having purged the head," [by errhines, because the flux proceeds primarily from the head?] "give a phlegmagogue-emetic, then having cleansed the belly with boiled milk," [by enemata?] "care for the rest of the body." Further on—p. 237—a similar treatment is ordered for chronic diarrhœa, and it is explained that the phlegmagogue-emetic meant is hellebore.

† GALEN—*Comm. VI in Hippoc. Epidem. VI*, § 5, [Ed. Kühn, XVII, B, p. 329:] "At in superiore ventre et maxime in ejus ostiolo id genus contractis humoribus in primis eos vomere jubemus;" also *Meth. Med.*, Lib. IV, Cap. 6, [*Id.*, X, p. 291:] "Quare nunc quoque, si etiamnum fluxio valenter irruat, ad contraria revellemus, utique si in superioribus nleus consistat, per inferna purgantes; sin autem in inferioribus sit, superiorem ventrem vacuantes." Compare HIPPOCRATES—*Aph. VI*, 15, [Ed. Littré, IV, p. 567:] "The vomiting which supervenes spontaneously in a chronic diarrhœa, cures it." On which GALEN comments [Ed. Kühn, XVIII, A, p. 24] that this is one of those cases in which the operations of nature ought to be imitated by the physician, and that such treatment proves useful by revulsion.

‡ ARCHIGENES, in ÆTIUS—Tetrab. III, Serm. 1, Cap. 37, p. 590, Ed. cited p. 656, *supra*: "Mirabiliter etiam vomitus efficaces sunt, tum in coma, tum jejunio facti, nimirum quæ corrupta sunt evacuantes, et quæ ad intestina dilapsa sunt attrahentes et converrentes, ac propterea ventris actiones revocantes." In ÆTIUS they are also commended in the early stages of dysentery following the ingestion of poisons—Tetrab. III, Serm. 1, Cap. 45, p. 608, Ed. cited—and in lientery—Tetrab. III, Serm. 1, Cap. 51, p. 618, Ed. cited.

§ AVICENNA—Lib. III, Fen 16, Tract. I, Cap. 4, p. 815, Ed. cited p. 632, *supra*: "Et iterum quandoque curatur fluxus ventris cum duretiis, et sudorem facientibus, et dilatantibus poros, et vomitum facientibus: omnia namque hæc movent materiam ad contrariam partem fluxus ventris." The practice indicated in this passage was long approved by the majority of physicians.

‖ ALTOMARUS—fol. 183, *op. cit.*, p. 680, *supra*; AMATUS LUSITANUS—*Cur. Med.*, Cent. II, Cur. 44, p. 285, Ed. cited p. 656, *supra*; FAB. HILDANUS—Cap. 8, p. 683, *op. cit.*, p. 644, *supra*; RIVERIUS—*Prax. Med.*, Lib. X, Cap. 6, p. 302, *op. cit.*, p. 680, *supra*—adds that ANGELUS SALA used salt of vitriol in half-drachm or drachm doses for this purpose; ROLFINCIUS—*Epit. Meth. Cognosc.*, Lib. III, Cap. 17, p. 238, Ed. cited p. 681, *supra*—commends emetics, especially if the ulcer is in the upper intestines.

¶ FORESTUS—*Obs. et Cur. Med.*, Lib. XXII, Obs. 34, Scholia, p. 379, Ed. cited p. 680, *supra*.

** FELIX PLATER—T. III, p. 810, *op. cit.*, p. 680, *supra*; SENNERTUS—T. III, p. 174, *op. cit.*, p. 645, *supra*.

†† BASIL VALENTINE—*Currus Triumphalis Antimonii*; I have seen only the English version, London, 1661: "Verily out of antimony may be prepared a medicine, (but all its venenosity must be first changed into medicine) which may be able to blot out and consume all diseases" p. 73. Among the diseases specified are phthisis, asthma, lepra, the plague, jaundice, dropsy, and fevers, &c.: "It comforts the head, the brain and what is of affinity to them, the stomach, the liver; it heales the diseases of the reins, it purgeth corrupt blood, expels malignant humours" &c., p. 73. I find however no specific mention of dysentery. PARACELSUS—*Par.*, Lib. I, Cap. 1, Par. 5, T. I, p. 492, *op. cit.*, p. 300, *supra*—advised that if dysentery prove obstinate and likely to become chronic a "*laudanum*" should be used, consisting of finely divided (drawn or leaf) gold, pearls, asphaltum, flowers of antimony, oriental crocus, myrrh and aloes. The same formula is repeated in Lib. I, *Par., Comm.*, p. 54?, *op. cit.*, as suitable for desperate cases, ("dissolutus jam deploratis utere isto laudano.")

and other peccant humors from the body by purging as well as by vomiting.* Early in the eighteenth century a Scotch minister named Steel used a secret remedy for dysentery, the receipt for which, about 1724, fell into the possession of Dr. George Young, who made it public. It was known at first as the stibium specificum, or as Young's antidysenteric powder, afterwards as the cerated glass of antimony, (vitrium antimonii ceratum.) In 1736 the celebrated Pringle read a discourse before the Edinburgh society for improving natural knowledge, in which he claimed for this preparation that it was a genuine specific for dysentery, and this not because of its emetic or purgative properties, for it sometimes cured without producing any evacuation. He supported his opinions by the testimony of Young and other practitioners who had used the drug.† The reputation of this medicine soon spread throughout Europe, though it appears to have been used more generally by the English than by the continental physicians; but it was found to be uncertain in its action and often dangerous, so that after a dazzling but brief popularity it fell into disuse. Pringle himself lived to abandon it.‡

Meanwhile similar objections were urged against the use of any of the antimonials: Van Swieten regarded them as objectionable because of the great perturbation they produced; Degner insisted that after taking them corrosions and even more serious lesions of the intestines were to be dreaded.§ Nevertheless, as will be shown when diaphoretic measures come to be discussed, the employment of certain antimonial preparations to

* F. DE LE BOE SYLVIUS—*De Meth. Med.*, Lib. II, Cap. 10, § 30–42, Opera, Amsterdam, 1679: "Ex antimonio infinita fere parantur vomitoria; quæque omnia simul sunt purgantia per alvum; quæ omnes educere solent humores in corpore peccantes, bilem, pituitam, et quodvis serum; adeo ut non putem ullum reperiri in rerum natura medicamentum ipsi antimonio æquiparandum; postquam non tantum omnis generis evacuantia, sed et alterantia ex ipso queunt parari; unde si aliqua reperiatur in rerum natura materia, ex qua parari possit medicamentum universale, morbos quosvis ab humorum vitiis pendentes curans, illa revera sit antimonium, quod ex parte saltem expertus loquor," § 30, p. 104. Yet it may be noted that it is only the so called "diaphoretic antimony" that appears in any of his formulæ for the treatment of the fluxes—*Prax. Med.*, Lib. I, Cap. 13, § 53, *op. cit.*, p. 183. I have not thought it worth while to collect other authorities with regard to the use of the antimonials in dysentery by the iatro-chemists. DEGNER—Cap. III, § 13, p. 129, *op. cit.*, p. 625, *supra*—mentions the crocus metallorum, the glass of antimony, tartar emetic and sulphur of antimony as having been thus used. The curious reader will find an account of the various antimonial preparations in use in the early part of the eighteenth century in the *Medicinal Dictionary* of JAMES, Vol. I, London, 1743, Art. Antimonium, and in the various essays collected under the head Antimoine in the *Bibl. Choisie de Méd.* of PLANQUE, T. II, Paris, 1749, p. 488 *et seq.*

† JOHN PRINGLE—*Vitrum antimonii ceratum, a specific medicine in the dysentery*, Med. Essays and Obs. published by a society in Edinburgh, Vol. V, Part I, 1742, p. 194 *et seq.* The preparation was made, according to YOUNG, by melting together an ounce of glass of antimony and a drachm of beeswax in an iron ladle, and, after stirring them together for half an hour over a slow fire, the resulting mass was cooled and powdered. The dose for an adult was 10 to 20 grains, p. 198. PRINGLE adds the favorable testimony of his uncle, FRANCIS PRINGLE, and several other practitioners.

‡ MACBRIDE—*loc. cit.*, p. 664, *supra*—wrote in 1771: "The vitrum antimonii ceratum, which was once so highly extolled, appears to have gone out of use on account of the extreme uncertainty of its operation, which, it must be confessed, is the fault of all antimonial preparations; nevertheless, in cases where the remedies proposed shall be found ineffectual, it ought to be tried." So, too, MOSELEY—p. 257, *op. cit.*, p. 648, *supra*—wrote: "After the cerated glass of antimony had been introduced into public practice, in the dysentery, its reputation soon spread over all Europe; but from the unguarded manner of giving it, while the patient was exposed, and walking about, without more restriction than was used in a common vomit, or purge, it was always dangerous, and it soon sunk into discredit." He held that the common glass of antimony was to be preferred, and even this, in his London practice, he finally abandoned for ipecacuanha, p. 253. PRINGLE already, in the first edition of his *Obs. on the Dis. of the Army*, London, 1752, p. 278, confessed that "notwithstanding I was convinced of its being a powerful remedy, yet the operation being always rough, I could not avoid being anxious about the event;" and adds: "Another inconvenience attends this medicine, common to all antimonials; which is the difficulty of making it to a standard. Hence it happens, that a moderate dose at one time, will be too little or excessive at another." He therefore used ipecacuanha as an emetic after bleeding, but thought that "there can be no harm in adding a grain or two of emetic tartar to a scruple of ipecacuanha; whereby the virtues of the root will be retained, and the medicine rendered more purgative and efficacious in evacuating the bile." In the 4th edition of his work, London, 1764, p. 270, and in subsequent editions, he explains his reasons for abandoning his "specific:" for "the roughness of its operation, and the prejudice conceived against the glass of antimony, as a medicine, having deterred the other physicians of the army, and the regimental surgeons from using it, I also desisted."

§ From the very first, indeed, the antimonial preparations met with a crowd of opponents. The faculty of medicine of Paris early condemned their use, and in 1566 the Parliament of Paris issued a decree forbidding physicians to employ them; see PLANQUE—T. II, p. 516, *op. cit.*, note *, *supra*—and SPRENGEL—Bd. III, S. 264, n. 546, *op. cit.*, p. 346, *supra*. This decree appears to have been unconsciously imitated by Surgeon General W. A. HAMMOND in his circular of May 4, 1863, by which tartar emetic and calomel were struck from the supply table of the army; (those who have deplored this order will be interested to learn from the statement of Surgeon W. C. SPENCER, U. S. A., that notwithstanding it, 21,804 ounces of tartar emetic were actually purchased for our army during the civil war.) The French decree differed, however, from this circular in the serious character of the penalties attached. In the year 1609 a physician, named BESNIER, was expelled from the faculty of medicine for having ventured to disobey it. (PLANQUE—*loc. cit.*—states that it was PAULMIER who was expelled for this reason in 1609, but according to SPRENGEL, although PAULMIER was summoned before the faculty in 1608 for having published a tract in which he defended the use of the antimonial preparations, he was excused on recanting his error.) But in spite of the penalty physicians continued to use antimony for various purposes. In the year 1637 its advocates succeeded in having it placed among the purgatives in the "Anti-dotaire" prepared in that year by order of the faculty, and although the extent to which this authorized its employment gave rise to subsequent disputes, it gradually came into common use—PLANQUE, *loc. cit.* Undoubtedly the introduction of ipecacuanha had much to do with causing the discontinuance of the use of antimonials in dysentery. VAN SWIETEN—T. II, § 722, p. 390, *op. cit.*, p. 663, *supra*: "Quamvis tamen ipecacuanha merito summo in usu sit, quin non tam valide corpus turbat, quam antimonialia vomitoria; et tuto etiam infantibus dari potest." DEGNER—*loc. cit.*, note *, *supra*—in a foot note adds that all the antimonial emetics possess caustic and drastic properties, and that they frequently give rise to fatal hypercatharsis.

provoke sweating continued to find favor in some quarters;* and tartar emetic, which Baker preferred to ipecacuanha, and Pringle and Macbride combined with it to make its action more energetic, continued to be occasionally employed as an emetic in dysentery until a comparatively recent period.† Tartar emetic was also sometimes combined with the saline cathartics either in considerable doses to produce an emeto-cathartic action, or in smaller proportion with the view of increasing the energy of the cathartic and of favoring the evacuation of bile.‡ Such a combination, long since commended by Sir Gilbert Blane and Bampfield, enjoyed a considerable popularity at the commencement of our civil war in consequence of the teachings of Surgeon C. S. Tripler, U. S. A.§

But in dysentery the addition of tartar emetic to the other remedies employed, as well as its use alone, may well be regarded with distrust. Its tendency to irritate the gastro-intestinal mucous membrane seems to be clearly established, and even when administered in moderate doses it sometimes unexpectedly gives rise to local inflammatory processes. When small doses are repeated at intervals for some time, or large doses are given, these accidents are still more common.‖ Nothing then could justify the administration of tartar emetic in dysentery or the other fluxes unless it could be shown to exert some favorable influence upon the progress of the disease that cannot be obtained in any other way. But all the effects which we are warranted by evidence in attributing to it may be obtained by other medicaments that are much less likely to aggravate the already existing intestinal lesion. Accordingly the use of antimonials in the fluxes, which during the last half century has been becoming less and less general, has fallen at last into deserved oblivion.

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* See remarks below under the head of diaphoretics.

† BAKER—p. 26, *op. cit.*, p. 437, *supra*—affirmed that tartar emetic diluted with much water excelled ipecacuanha and all other emetics in this disease, and that it is truly wonderful how much yellow and green humor it brings up, and with what relief to the patient; a beneficial sweat follows, and moreover a thorough purgative effect, p. 27. PRINGLE—*loc. cit.*, note ‡, p. 690, *supra*. MACBRIDE—*loc. cit.*, same note. CHRISTIE—*On the nature and causes of dysentery*, The Med. and Phys. Jour., Vol. I, 1799, p. 465—states that at Bombay, if the tongue was foul and nausea and vomiting occurred, "we generally began by giving an antimonial emetic, as a solution of four or five grains of the antimonium tartarisatum, dissolved in four ounces of water; and the patient directed to take an ounce of this every fifteen minutes till he vomited; and if, as generally happened, it also operated by stool, so much the better." FOURNIER et VAIDY—p. 374, *op. cit.*, p. 302, *supra*—after twenty years' experience, regarded tartar emetic and ipecacuanha as equally suitable in the early stages of simple dysentery: where purgation as well as emesis is desired, the former is preferable; when the flux is already considerable, the latter. A similar view was held by VIGNES—p. 270, *op. cit.*, p. 682, *supra*. VOGT—S. 170, *op. cit.*, p. 645, *supra*—as late as 1856 expressed the opinion that the condemnation of tartar emetic has been carried too far, and advised its use after the method of RASORI, to the extent of 5 to 6 grs. in the twenty-four hours, so as to provoke first vomiting, then purging, and finally diaphoresis in cases accompanied by severe fever, &c.

‡ According to BARRIER, an "emetico-cathartic" should be prepared by combining half a dose of emetic with half a dose of purgative, *e. g.*, one or two grains of tartar emetic with one or two drachms of sulphate of soda or sulphate of magnesia, dissolved in four cups of water; I cite from J. B. BECK—*Lectures on Materia Medica and Therapeutics*, 3d Ed., New York, 1861, p. 32.

§ GILBERT BLANE—p. 455, *op. cit.*, p. 637, *supra*: "It is in all cases of the utmost consequence to administer as early as possible a brisk saline purgative. An ounce and a half or two ounces of purging salts may be dissolved in a quart of barley water or water gruel, and given warm in cupfuls, at small intervals, till a free and copious evacuation is produced. If there should be much fever, or sickness at stomach, two grains of emetic tartar will be a great improvement of this medicine." A. GRANT—*Fragments of the medical practice in Calcutta at the close of the last century*, The Indian Annals of Med. Science, Vol. VII, 1861, p. 562—tells us that "the practice of commencing the treatment with a dose of Glauber's salts and tartar emetic" was the ordinary routine in the Calcutta hospitals in 1797. R. W. BAMPFIELD—p. 116, *op. cit.*, p. 682, *supra*—commends either sulphate of magnesia or sulphate of soda thus combined. G. B. WOOD—*A Treatise on the Practice of Medicine*, Philada., 1847, Vol. I, p. 572—speaking of the purgatives suitable for dysentery: "Some prefer the neutral salts, as sulphate of magnesia, sulphate of soda, tartrate of potassa and soda, &c. These are especially applicable when there is much fever, with a hot dry skin. In such cases, they are sometimes associated with tartar emetic in solution, and given in divided doses, so as at once to relax the skin and operate on the bowels." C. S. TRIPLER and G. C. BLACKMAN—*Hand-book for the Military Surgeon*, Cincinnati, 1861, p. 33: "When a man is attacked with any of the forms of camp dysentery, my constant practice is to give at once a purgative dose of sulphate of magnesia, ℥i combined with ½ to ¼ a grain of tartar emetic. If this does not procure copious catharsis, I repeat the dose the next day or the day after. My object is to unload the portal vessels, as well as to remove any irritating matters that may be present in the intestinal canal." TRIPLER has been erroneously credited with originating this practice.

‖ With regard to the anatomical lesions observed after antimonial poisoning, see F. W. BÖCKER—*Die Vergiftungen in forensischer und klinischer Beziehung*, Iserlohn, 1857, S. 36; A. S. TAYLOR—*On poisoning by tartarized antimony*, Guy's Hospital Reports, 3d series, Vol. III, London, 1857, p. 369 *et seq.*—who has collected and tabulated a number of fatal cases, in several of which the post-mortem appearances are recorded. Among the text-books, see WHARTON & STILLÉ—Vol. II, Part 1, p. 441, *op. cit.*, p. 627, *supra*; A. TARDIEU—*Étude Méd.-Légale et Clinique sur l'Empoisonnement*, 2me Éd., Paris, 1875, p. 729 *et seq.*; A. S. TAYLOR—p. 461, *op. cit.*, p. 627, *supra*; and H. C. WOOD—p. 145, *op. cit.*, p. 675, *supra*. For the post-mortem appearances in animals after antimonial poisoning, see C. HAMPFIELD JONES—*Examination of the effects produced by certain poisons*, Medical Times and Gaz., N. S., Vol. IV, 1852, p. 362; B. W. RICHARDSON—*Half-yearly report on forensic medicine and toxicology*, British and Foreign Med.-Chir. Review, Vol. XVIII, 1856, p. 521; and NEVINS—*Slow poisoning by antimony*, Pharmaceutical Jour. and Trans., Vol. XVI, 1856-7, p. 415. I may add a significant passage, written by TROUSSEAU—Art. *Antimoine*, Dict. de Méd., 2me Éd., T. III, Paris, 1833, p. 573—at a time when the free use of antimony in medicine was still common: "The traces which tartar emetic leaves in man [after death] have never been determined except when this poisonous agent has been administered as a medicine to patients who have succumbed. An inflammation of the stomach and of the intestine is the only thing that has been found. I have seen in the stomach quite large ulcers and a trifling hæmorrhage."

The use of *ipecacuanha* in the fluxes was made known by Piso (1648) in his De Medicina Brasiliensi. In the extravagant language of his times he described it as a sacred anchor, and as the most exquisite gift of nature. He claimed that it not only evacuated the morbid humors by purging as well as by vomiting, and produced revulsion from the diseased intestine, but that a certain astringent effect succeeded its primary action. He gave at a dose two drachms of the root in infusion or decoction, and repeated this draught next day and even the day following. He describes as the favorite method of administering the drug in Brazil what was afterwards known in France as the Brazilian method, (*l'ipeca à la brésilienne.*) The drug is macerated in water over night, and the infusion administered to the patient; the residue is then macerated again, and the second infusion also administered; this second infusion is less active in its emetic and purgative effects, but more astringent, and serves therefore to restore tone to the viscera.*

But neither the work of Piso nor the importation of a considerable quantity of the root into France in 1672† appears to have received much notice at the time. It was not until after the drug had been used by Adrien Helvetius as an antidysenteric nostrum, and Louis XIV had paid him a thousand louis-d'or to make his secret known, that it attracted general attention from the medical profession. Helvetius was loaded with honors, and ipecacuanha, in spite of a few incredulous doubters, was regarded for a while as a specific for dysentery.‡ As such it was lauded by Baglivi,§ who affirmed that it was an almost infallible remedy for dysenteric fluxes. This reputation it continued to enjoy for a while, and acquired the title of radix antidysenterica, although it was often used injudiciously and several roots of inferior nature were sold under its name.‖

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* GULIELMUS PISO—*De Med. Brasiliensi*, in Historia Naturalis Brasiliæ, Leyden, 1648, Lib. II, Cap. II, p. 28: "Dehinc ad radicem Ipecacuanha, tanquam ad sacram anchoram, confugiendum, qua nullum præstantius aut tutius, cum in hoc, tum in plerisque aliis, cum vel sine sanguine, fluxibus compescendis, natura excogitavit remedium. Quippe præterquam quod tuto et efficaciter tenacissimos quosque humores per ipsam alvum, sæpissime autem per vomitum ejiciat, et a parte affecta derivet, vim quoque astrictivam post se relinquit." As to the dose he remarks: "Dragmæ duæ Radicis Ipecacuanha in 3iiij. vini coctæ, vel per noctem maceratæ, cujus infusum cum vel sine oxymelis 5j. exhibetur. Postridie semel atque iterum pro re nata, secunda imo tertia ejus decoctio repetenda, tam quod ægri debiliores eam facilius ferant; quam quod astrictoria ejus vis tunc magis efficax appareat." In Cap. 14, p. 30, he speaks of it as "radicem Ipecacuanha, exquisitissimum naturæ munus," and in Lib. IV, Cap. 65, p. 101, remarks: "Præter facultatem purgatricem per superiora et inferiora, omni veneno eximie adversantur." In the same chapter, after describing the two varieties of ipecacuanha known to him, he gives the method of administering successive infusions as follows: "Utriusque quotidianus est usus, malunt tamen dilutum, quod vel unius noctis sub dio macerationc aut actione in aqua, medicam suam virtutem abunde liquoribus communicet. Postea caput mortuum reservatum, denuoque eodem modo præparatum, in eumdem usum exhibetur; minus quidem efficax ad purgandum vel vomendum, sed magis adstringens. Ita ut radix hæc non solum materiam morbificam, licet tenacissimam, a parte affecta revellat, eamque per superiora expellat, sed et astringendo viscerum tonum restituat."

† It was imported by a physician named LE GRAS: see ELOY—*Dict. Hist. de la Méd.*, Paris, 1755, T. II, p. 26.

‡ ELOY—*loc. cit.;* DEZEIMERIS—*Dict. Hist. de la Méd.*, Paris, T. III, 1836, p. 104; SPRENGEL—Bd. IV, S. 542, *op. cit.*, p. 346, *supra;* MÉRAT—Art. *Ipécacuanha*, Diet. des Sci. Méd., T. XXVI, Paris, 1818, p. 1 *et seq.* It would appear that HELVETIUS, while a student of medicine in Paris, visited, along with AFORTI, a celebrated physician of the faculty and botanist royal, a rich druggist named GRENIER or GARNIER, who on recovery presented to his physicians five or six pounds of the Brazilian root. AFORTI attached no importance to the present, and turned it over to his lucky assistant. HELVETIUS tried it with success, and contrived to import fresh quantities from time to time through GARNIER. The new remedy speedily acquired great renown in his hands, but he kept its nature secret. The cure of several courtiers and finally of the Dauphin, son of LOUIS XIV, raised the fame of HELVETIUS to the highest pitch, and brought about the purchase of the secret by the King. Vainly did the druggist, GARNIER, protest that the credit of the remedy belonged to him. HELVETIUS was appointed esquire, counsellor, medical inspector general of the hospitals of French Flanders, &c. He published, on the use of ipecacuanha in dysentery, a work—*Remède contre le cours de ventre*, Paris, 1688—which I have not been able to see, in which he fixes the dose at two drachms, given in decoction either by the mouth or as a clyster. Sir HANS SLOANE and the celebrated LEIBNITZ assisted by their praises in drawing general attention to the new drug. Among those who attacked the position of HELVETIUS, J. B. ALLIOT—*Traité du Cancer, etc., avec un examen du système et de la pratique de M. Helvetius*, Paris, 1698—appears to have been the chief. In this little tract he chiefly attacks the views of HELVETIUS as to the treatment of cancer; but in the preface he alludes to the remedy for dysentery, the credit for which he claims belongs to GRENIER, and compares HELVETIUS to the jackdaw that borrowed the peacock's feathers. See, also, among the early laudations of the specific virtues of ipecacuanha, the paper of EMANUEL KÖNIG—*Novæ radicis exoticæ, Hipepocoanna dictæ virtus antidysenterica*, Ephem. Med.-Phys. German., Dec. II, An. X, 1691, Obs. 115, p. 209. On the other hand, according to MERAT—p. 28, *op. cit., supra*—TOURNEFORT observed that the remedy did not answer so well in camp dysentery as in the sporadic cases, and GEOFFROY observed that it was less efficacious among the squalid poor than among the more comfortable classes; which is readily understood if we consider the greater frequency of severe diphtheritic cases in camps and among the poor.

§ BAGLIVI—*Prax. Med.*, Lyons, 1699, Lib. I, Cap. 9, p. 79: "Radix hipecacuanhæ est specificum, ac ferme infallibile remedium in fluxibus dyssentericis, aliisque hæmorrhagiis sanguineis, colliquationibus humorum," &c. In support of this statement he cites the testimony of the English physician and botanist, WM. SHERARD, and that of the celebrated Swiss physician, J. J. MANGETUS, as well as the work of PISO.

‖ DEGNER—Cap. III. § 14, p. 129 *op. cit.*, p. 625, *supra*—remarks: "Nonnulli radicem illam e Brasilia allatam, ipecacuanham dictam, tanquam primarium et specificum contra dysenterias emeticum commendant, quia eum in India Orientali, tum in Occidentali, in omnibus dysenteriis et diarrhœis magno cum successu adhibetur, unde etiam nomen radicis antidysentericæ κατ' ἐξοχήν accepit." JAMES—Vol. II, *op. cit.*, p. 690, *supra*, Art. *Ipecacuanha*—gives as a reason for the failure of some of those who tried it that it was given in the quantity of two drachms at a dose, which was too great. Yet this was the dose that PISO- Lib. IV, Cap. 65, p. 102, *op. cit.*, note *, *supra*—used in decoction of the brown or more active ipecacuanha; in powder

Degner, who employed it with success in the Nimeguen epidemic, shrewdly pointed out that its usefulness is limited to the early stages of the disease, before organic lesions of the intestinal tissues have actually occurred. He held that at this period it not merely acts in the modes described by Piso, but that it has peculiar and specific virtues possessed by no other drug. He gave the powder in the dose of half a drachm to two scruples, repeated a second or even a third time if the disease did not yield.* The belief in the specific powers of ipecacuanha gradually died out; Hoffmann held that it owed its value merely to its evacuant action, that it was not always necessary, nay, even that it often produced injurious effects;† but even those who took this view of its operation preferred it to other drugs of the same class. It is recommended as an emetic in the early stages of dysentery by Van Swieten, Tissot, Akenside, Hillary, Zimmermann, Geach and Moseley;‡ while Pringle, Macbride and Donald Monro§ gave it under the same circumstances combined with a little tartar emetic to increase the activity of its operation.

Exaggerated notions of the beneficial action of emetics, the result of the former belief in the specific powers of antimony and ipecacuanha, undoubtedly led to extravagances in their use, and the consequent disasters brought about a reaction in medical opinion on this subject. Cullen not merely denied the specific powers of ipecacuanha, but asserted that no emetic can be of much service unless it operates also by stool, and cautioned against repeating the administration of such medicines too frequently.‖ Hunter advised that purgatives should be preferred, pointing out that the sickness produced by an emetic is always distress-

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he states its dose to be a drachm. SPRENGEL—*loc. cit.*, note ‡, last page—appears erroneously to suppose LEIBNITZ to have been the first to mention the use of the drug in powder. Besides the brown, PISO—*op. cit.*, p. 101—described a milder variety under the title ipecacuanha blanca. J. DOUGLAS, in the Philosophical Transactions—I cite JAMES, *loc. cit.*—was acquainted with "four kinds, black, brown, grey, and white," but was unable "to determine whether they belong to different plants, or are only varieties of the same plant, owing to the soil in which they grow, as is affirmed by Sir Hans Sloane." WALTER HARRIS—*Diss. Med. et Chir.*, London, 1725, p. 250; I quote from SPRENGEL, *loc. cit.*—states that the English apothecaries sometimes sold a poisonous root under the name of ipecacuanha.

* DEGNER—paragraphs following *loc. cit.*, last note: "Sed etiam eadem ipecacuanha in nostra dysenteria mirabiles effectus edidit," § 20, p. 134. "Conducit autem hæc radix in omnibus casibus, ubi causa morbosa adhuc in primis viis hæret mobilis, et, quod notandum, partes solidas eondum adfecit," § 16, p. 131. "Nam præter effectum suum emeticum simul adeo *peculiare* et *specificum quid* operatur, ut alia vomitoria eam non facile æquent," § 17, p. 132. He points out that if after its use the flux increases and the strength of the patient fails, the prognosis becomes unfavorable, § 27, p. 138.

† HOFFMANN—T. III, p. 155, *op. cit.*, p. 681, *supra*. He gave from a scruple to half a drachm, followed by large draughts of tepid water to promote vomiting. In a subsequent passage—Cautelæ, § 6, p. 157: "Radix ipecacuanhæ, quæ pro specifico antidysenterico a multis habetur, non omnino suo caret usu; licet etiam sæpissime sinistros producat effectus." He regarded it as most likely to be useful in robust subjects when the primæ viæ were loaded with crude materials, or the patient had recently been exposed to a contagious miasm.

‡ VAN SWIETEN—*loc. cit.*, p. 690, *supra*. TISSOT—T. III, p. 8, *op. cit.*, p. 625, *supra*—who wrote: "Le grand remède de cette maladie, c'est l'émétique." He used for this purpose either his "remède No. 34," which was 6 grains of tartar emetic, or his "remède No. 35," which was 35 grains of ipecacuanha, and appears to have regarded them about equally useful. Of the latter he remarks: 'Il avoit même été regardé très-longtems comme un spécifique sûr: il ne l'est pas, mais il est très-utile." AKENSIDE—p. 34, *op. cit.*, p. 681, *supra*—administered a scruple of ipecacuanha at the beginning of the disease after bleeding, "ut omni inutili onere ventriculus levetur." HILLARY—p. 209, *op. cit.*, p. 681, *supra*—followed the same plan, but if this failed to give relief resorted to the cerated glass of antimony. I may add that CLEGHORN—Chap. 5, p. 240, *op. cit.*, p. 637, *supra*—used these two emetics almost indifferently, though he remarks: "I prefer the ipecacuanha, as being certain in its operation; whereas the other sometimes did not produce the intended discharge, at other times occasioned greater commotions than were expected." ZIMMERMANN—Cap. 5, S. 80, *op. cit.*, p. 648, *supra*—in the Swiss epidemic began the treatment with an emetic of ipecacuanha, giving at the most 40 grains. He gave it with good results, even when not sent for till a week or two after the beginning of the disease, unless he suspected ulceration or suppuration of the bowels—S. 82; yet in a subsequent part of this work, in connection with a scholastic picture of inflammatory dysentery, he declares that in this variety of the disease emetics are a deadly poison—"ein tödendes Gift,"—S. 382. GEACH—p. 21, *op. cit.*, p. 669, *supra*. MOSELEY—p. 229 *et seq.*, *op. cit.*, p. 648, *supra*.

§ PRINGLE—*loc. cit.*, note ‡, p. 690, *supra*. MACBRIDE—*loc. cit.*, p. 661, *supra*. DONALD MONRO—p. 70, *op. cit.*, p. 625, *supra*. I may mention here that A. STILLÉ—*Therapeutics and Materia Medica*, 4th Ed., Philada., 1874, Vol. II, p. 450—has fallen into a curious mistake as to PRINGLE's views with regard to ipecacuanha, remarking: "He, indeed, laid it aside on account of the distress produced by its action; yet he adds, 'Upon the whole, I am not clear whether it is not the surest method of cure.'" The passage cited occurs only in the first three editions of the *Diseases of the Army*; and an examination of these will show that it relates to the plan of giving five grains of ipecacuanha at a time, "repeated twice or thrice in the same day, till a vomiting or purging came on," instead of giving a single dose. Of this plan PRINGLE says: "I laid it aside on account of the excessive sickness that generally accompanied the operation; tho' upon the whole I am not yet clear, whether it is not the surest method of cure," 1st Ed., London, 1752, pp. 277-8. In the 3d Ed., London, 1761, pp. 237-8, the passage is modified so as to read, instead of "I laid it aside," "yet I did not always use it, on account of," &c. In the 4th Ed., London, 1764, p. 271, this passage is omitted, and the practice of giving a scruple of ipecacuanha is recommended, with the addition of two grains of tartar emetic, "for the common men," or five-grain doses may be given, "repeated at an hour's distance, twice or thrice, till a purging was brought on." Nothing is said any more of the excessive sickness. In the 7th Ed., London, 1774, p. 251, the same practice is commended, except that the tartar emetic is no longer reserved for the common men, but is now said to be "generally added."

‖ CULLEN—*First Lines*, § 1081, Vol. II, p. 325, Ed. cited p. 648, *supra*: "Vomiting has been held a principal remedy in this disease, and may be usefully employed in the beginning of it, with a view to both the state of the stomach and of the fever: But it is not necessary to repeat it often; and unless the emetics employed operate also by stool, they are of little service. Ipecacuanha seems to possess no specific power; and it proves only useful when so managed as to operate chiefly by stool."

ing and that it is most beneficial when it also purges.* Even Max. Stoll, who so zealously advocated the use of emeto-cathartics at the commencement of bilious dysentery, taught that, if imprudently reiterated, emetics exhaust the vital powers, render the disease more obstinate, and that when the dysentery is accompanied by a putrid fever an emeto-cathartic is not well borne because of the prostration that follows its use.† Fournier and Vaidy forbade emetics in the so called inflammatory dysentery, insisting that they could only serve to irritate the already inflamed mucous membrane.‡

The use of emetics now fell into pretty general disfavor. This was due in part to the popularity acquired by purgative medicines, especially calomel,§ in part to the influence of Broussais, who asserted that emetic doses of ipecacuanha often act injuriously upon the colon, rendering the flux bloody and painful instead of curing it; advised that their use should be restricted to special cases, and altogether denied that ipecacuanha possesses any antidysenteric virtues.‖ Baly's experience with ipecacuanha was equally unfavorable.¶ Bamberger, while he admitted that emetics may occasionally prove serviceable at the beginning of the disease, by evacuating the stomach if it be loaded with undigested food, held their employment for any other purpose to be purely empirical and likely to do more harm than good; he favored the use of small doses of ipecacuanha for its diaphoretic action, especially in the milder cases, but, even thus administered, thought the resulting benefit was in great part to be ascribed to the opium with which it is usually combined.**

Even during this period of neglect, however, there were a few physicians who continued to treat dysentery with ipecacuanha in large doses. Balmain was induced by his knowledge of the success of an empiric to give two drachms of the powder at a dose, with the addition of sixty drops of laudanum, during an epidemic at Norfolk Island in the spring of 1795. He found that, if the patient was kept still, nausea seldom followed, and oftentimes he had no stool at all next day, although previously the gripings had been violent and the bloody discharges frequent.†† Playfair,‡‡ while surgeon of an Indiaman in 1803–4,

* J. HUNTER—p. 238, *op. cit.*, p. 637, *supra*.

† MAX. STOLL—T. III, p. 259, *op. cit.*, p. 342, *supra*—especially commends the use of the emeto-cathartics in the variety of dysentery which he calls *rheumatico-biliosa*. He treated all the dysenteries of the summer of 1776, and many of the cases he saw in Hungary in 1773–4, in this manner. For the objections and limitations to their use referred to in the text, see pp. 267–8.

‡ FOURNIER et VAIDY—p. 392, *op. cit.*, p. 362, *supra*—did not hesitate, however, even in these cases to give small doses of tartar emetic for its diaphoretic action. They used larger doses of the same drug, or ipecacuanha, as emetic in simple and mucous dysentery, pp. 374 and 394, and even at the beginning of the disease in dysentery complicated with typhus, p. 396, and adynamic dysentery, p. 398.

§ See, *infra*, the remarks on the general use of calomel as a purgative in dysentery during the early part of the present century.

‖ BROUSSAIS—T. III. p. 227 *et seq.*, *op. cit.*, p. 643, *supra*: "Je ne lui reconnais aucune vertu anti-dysentérique." He declares that he made use of ipecacuanha for a long time, and if in six cases it diminished the flux, which might have been done better by other means, it aggravated it in the seventh, producing a decided condition of inflammation which had subsequently to be combated. He therefore limited its use to cases where the stomach contained worms or where it seemed probable that there was an accumulation of bile in the stomach or liver.

¶ BALY—p. 536, *op. cit.*, p. 535, *supra*: "But ipecacuanha has wholly failed in my hands as a specific, or in any way active, remedy for the disease."

** BAMBERGER—S. 415–416, *op. cit.*, p. 578, *supra*. NIEMEYER—Bd. II, S. 755, *op. cit.*, p. 645, *supra*—also limits its use to the beginning of the disease and to cases in which the stomach is filled with undigested food. On the other hand, TROUSSEAU—T. III. p. 170, *op. cit.*, p. 664, *supra*—although he prescribed ipecacuanha only at the beginning of the disease and in emetic doses, believed it to act as a powerful modifier, much like the purgatives, on the whole digestive tube as well as the stomach. He regarded it as most useful in bilious dysentery.

†† W. BALMAIN—*An account of the effects of ipecacuanha in the cure of dysentery at Norfolk Island*, Memoirs of the Medical Society of London, Vol. V. 799, p. 210. He made the powder into pills, "which were made as large as possible to admit of their being swallowed." The patient "lay on his back, with the head and chest tolerably elevated." A dose of Glauber's salts was generally administered before the ipecacuanha, and thought to render it more efficacious.

‡‡ GEORGE PLAYFAIR—*On the good effects of a combination of ipecacuan and laudanum in dysentery*, The Edinburgh Med. and Surg. Jour., Vol. IX, 1813, p. 18—was undoubtedly induced to try this plan by the success of BALMAIN, for he writes: "I recollected to have seen in, I think, a medical review, that ipecacuan and opium had been tried in large doses with effect. The hint determined me to make the experiment, and I had every reason to be grateful for the success with which it was attended. * * * I prescribed from half a drachm to a drachm of ipecacuan, combined with from 30 to 60 drops of laudanum, confining the patient for some hours afterwards to a horizontal posture. It often happened, however, that notwithstanding their attention to remain in this position, the first dose was vomited, but a second was commonly retained. It was usually the case, that after the medicine was taken, no evacuation to stool was experienced for many hours, the patient being, during that time, easy and free from the griping pain; several loose motions then took place, but unmixed with blood, and unattended with tenesmus. * * * Seldom more than one dose was required to cure the disease; but when any symptoms remained, a repetition next day was sufficient to produce the desired effect. It must however be remarked, that this treatment was always adopted at the commencement of the attack; for when the disease had been of any standing, the stomach was too irritable to retain the medicine even for an instant. Its good effects certainly did not follow a relaxation of the surface of the body; such a circumstance seldom occurred."

adopted the same practice with equally favorable results. Smaller non-emetic doses of ipecacuanha were strongly recommended by Twining in 1829.* Emetic doses were regarded as occasionally useful by Vignes, and Hauff reports that they were freely prescribed by several of the Wurtemberg physicians during the epidemic of 1831.†

Ségond in 1835 drew attention anew to the Brazilian method of successive infusions, which, however, he employed chiefly in what he called the serous variety of dysentery. He made and administered a third infusion from the same dose of the drug, while Piso described but two.‡ This modified method appears to have enjoyed considerable popularity among the French naval surgeons in the treatment of tropical dysentery.§ In 1851 it was made the subject of a special essay by Savignac. In his experience the first infusion almost always provoked vomiting, and sometimes, but not always, numerous stools; the second infusion, given next day, seldom vomited, the stools continued of about the same frequency or diminished in number; more or less nausea was pretty constantly felt; the third infusion, given on the third day, did not usually nauseate, and the stools now began to diminish in frequency, unless the disease was too violent to yield to the medicine. In the sporadic dysenteries of Europe two or three grammes of ipecacuanha thus given usually sufficed to modify the morbid condition; if it did not, a second or even a third series of infusions was ordered. The beneficial effects of the drug were in his opinion due, not merely to its emetic and purgative action, nor yet to the diaphoresis which almost invariably followed its use, but to a peculiar dynamic sedative and alterative action.‖

This memoir did not at the time attract much notice out of France, but a few years later renewed attention was directed to the use of ipecacuanha in dysentery by the memoir of Docker, (1858,) who had successfully employed it on the island of Mauritius. His method of administration was essentially similar to that of Balmain and Playfair. The patient was put to bed, a draught containing a drachm of laudanum administered and a sinapism applied over the stomach; half an hour later a dose of ipecacuanha, usually from twenty to thirty grains, but sometimes as much as a drachm or a drachm and a half, was administered. In many cases this dose was not followed by emesis, but if it was he repeated it at once until it was retained, except in the case of the larger doses, when he generally

* TWINING—*Obs. on the employment of large doses of ipecacuanha in dysentery, without exciting vomiting*, Trans. of the Med. and Phys. Society of Calcutta, Vol. IV, 1829, p. 174—regarded six grains as a large dose. He gave it every night at bed time, combined with four grains of extract of gentian and five of blue mass. The latter ingredient was omitted after "a cessation of all the distressing symptoms" was obtained.

† VIGNES—*loc. cit.*, p. 682, *supra*. He prescribed it if there was gastric embarrassment at the beginning of the disease, with thin or copious stools. Under the same circumstances, if the stools were scanty and the patient strong, he preferred tartar emetic. If he gave ipecacuanha, the dose was half a drachm or more, given in hot infusion. HAUFF—S. 401, *op. cit.*, p. 534, *supra*—recommends mere emetic doses in all forms of dysentery except the inflammatory. Their use by the Wurtemberg physicians is also mentioned on S. III, 120, &c.

‡ SÉGOND—*Considérations pratiques sur la nature et le traitement de la dysenterie*, Jour. Hebd., T. I, 8me Année, 1835, p. 175 *et seq.*—made three varieties of dysentery, the sanguine, the bilious and the serous, and recommended *l'ipéca à la brésilienne* chiefly in the latter. He used, to make the infusions, 24 grains of the drug. It would appear from his remarks that this method was not infrequently used by his contemporaries, for he remarks: "Tout médecin qui administre l'ipéca d'après cette formule, évite soigneusement que la plus petite quantité de marc ne se mêle à l'infusion; mais ce marc, dira-t-on, étant parfaitement inerte, après trois infusions et macérations de la substance mère, cette crainte est chimérique." FABRE—*Traité de matière médicale et de thérapeutique*, in Bibl. du Méd. Praticien, T. XIV, Paris, 1850, p. 404—also described the method of making three successive infusions. He used 8 grammes of the drug and 120 grammes of water for each infusion.

§ SAVIGNAC—p. 100, *op. cit.*, next note: "If a great number of physicians on the Continent are ignorant of this method or neglect to use it, there is perhaps not a single naval surgeon, who has observed and treated dysentery in the tropical colonies, who does not know it, who has not seen others use it or used it himself."

‖ J. DELIOUX DE SAVIGNAC—*Mémoire sur l'ipéca*, (lu à l'Acad. Nat. de Méd., Juin 3, 1851,) Gaz. Méd. de Paris, T. VII, 1852, p. 87 *et seq.*—equally lauds the virtues of ipecacuanha given in the Brazilian method in the treatment of pleuro-pneumonia. When this method is used in dysentery, tolerance is soon established, the abdominal pains diminish; the stools diminish in frequency and become more healthy in appearance; the pulse becomes slower and the fever diminishes, and a slight but sufficient diaphoresis occurs. As to its mode of action, he writes: "Pour moi, l'ipéca est un hyposthénisant pur, un sédatif (ce dernier terme est plus intelligible et exclut mieux tout préjugé doctrinal), un sédatif portant particulièrement sur les systèmes nerveux et sanguin; un altérant aussi, peut-être, qui introduit dans nos humeurs l'un de ces principes qui, à si petites doses, suscitent des effets si intenses dans l'organisme," p. 104. This memoir was referred to a committee, MM. GUIBOURT, PÂTISSIER and DESPORTES, who, in their report, while recommending that the studious zeal of the author should be encouraged by thanks for the communication of his work, were cautious not to commit themselves to his speculations as to the action of the drug—Bull. de l'Acad. Nat. de Méd., T. XVI, 1850–1, p. 1231. F. LAURE—*Hist. Méd. de la Marine Française pendant les Expéditions de Chine et de Cochinchine*, Paris, 1864, p. 52—relates that this precious agent rendered great service in the French expedition to China.

waited ten or twelve hours before repeating. A single dose, however, often sufficed for a cure; the pains promptly subsided and the stools ceased. He gave it to patients of various constitutions, and in all stages of the disease, with equal benefit; and out of upwards of fifty cases lost but one. As to the mode in which the drug acted he offered no theory, but expressed his belief that the time would come when it would be regarded as much a specific in dysentery "as bark is in ague and sulphur in itch."*

The rapid and successful introduction of Docker's method in India is sketched in the papers of Donaldson, Massey, Cornish, Cunningham and Ewart.† There were not wanting some who, like Blacklock, cautioned against its indiscriminate use, and declared that in unsuitable cases, when the local disease is too far advanced, or the patient in an asthenic condition, it aggravated instead of mitigating the disease.‡ But such warnings seemed to secure little consideration; its indiscriminate administration became pretty general in India, and Docker's method was soon introduced into England, where it received the support of Waring, Maclean and Aitken.§ These writers commend it chiefly in acute cases, but it appears from various journal articles‖ that it has also been pretty freely used in the chronic

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* E. S. DOCKER—*On the treatment of dysentery by the administration of large doses of ipecacuanha*, The Lancet, 1858, Vol. II, pp. 113 and 169: "The ipecacuan is administered—generally in a draught, sometimes in the form of pill or bolus—and the semi-recumbent posture steadily maintained." As to its effects he says: "In all constitutions, robust as well as delicate, under all circumstances, the result is the same. In the very worst cases, when the strength of the patient is almost exhausted, after the whole range of remedies has been tried in vain, the disease running its course swiftly and surely to a fatal issue, ninety grains of ipecacuan have been given, and forthwith the character of the disease, or, I should rather say, the character of the symptoms has been entirely changed; for the disease itself is literally cured, put a summary stop to, driven out." He gives, in illustration of the mode in which the drug acts, a sketch of five successfully treated cases and one fatal case. Towards the close of this paper he remarks: "As regards the rationale of the action of ipecacuan in large doses, I will not venture on so debateable a point to express an opinion. That it is a very energetic *tonic* is sufficiently evident; equally certain that it is a most powerful *styptic*, (this being the effect of its tonic property)," &c.

† JAMES DONALDSON—*On the diarrhœa and dysentery of India and China*, Edinburgh Med. Jour., Vol. V, 1859-60, p. 583—reports that DOCKER'S method (he writes, "I am sorry I have forgotten his name") was "introduced into Madras, or rather recommended for adoption in India, by Dr. M. Rogers." He himself tried it in doses of 30 grains, and was "much gratified with the perfectly successful result," p. 589. He reports 8 successful cases. MASSEY—*On acute dysentery, referring especially to its treatment by large doses of ipecacuanha in the regimental hospital of the 2nd dragoon guards during the year 1859, in Oude*, Statistical, Sanitary and Medical Reports, (British Army,) for the year 1859, p. 280. W. R. CORNISH—*Remarks on the treatment of acute tropical dysentery by large doses of ipecacuanha*, &c., The Madras Quarterly Journal of Med. Science, Vol. II, 1861, p. 41—gives a further account of the introduction of this method in India. He shows that from 1842 to 1859 the mortality from dysentery among the European troops in the Madras army had averaged 7.1 per cent. of the cases treated; while of 297 cases among the same troops treated after 1858 with ipecacuanha, only 4, or 1.3 per cent., had died. R. W. CUNNINGHAM—*On the treatment of acute dysentery by ipecacuanha*, Edinburgh Med. Jour., Vol. VII, 1861, p. 25—writes that the plan of Surgeon DOCKER is rapidly superseding all other modes of treating dysentery in India. J. EWART—p. 378 *et seq.*, *op. cit.*, p. 681, *supra*—gives an interesting account of the progress of this method in Bengal Madras and Bombay up to 1862. He tabulates, in addition to the cases of CORNISH in Madras, 658 cases of Europeans thus treated in Bengal, with a mortality of 19, or 28.87 per 1,000—p. 392; and estimates the diminished mortality, resulting from the introduction of the ipecacuanha treatment, at 46.63 per 1,000 cases treated—p. 394. As to its mode of action, he remarks: "Thus, it may be said that we possess, in ipecacuanha, a direct and safe antiphlogistic, a powerful sudorific, an unirritating purgative, a certain cholagogue, a pancreatic stimulant, and a harmless sedative to the heart and muscular fibres of the large intestine,"—p. 403.

‡ A. BLACKLOCK—*Report on cases of acute dysentery treated by large doses of ipecacuanha*, The Madras Quart. Jour. of Med. Science, Vol. II, 1861, p. 256 *et seq.*: "When I first arrived in India, I saw cases successfully treated by large doses of ipecacuanha; but I also saw others in which ipecacuanha aggravated instead of mitigating the disease. I now regard these failures as cases of ipecacuanha dysentery,"—p. 292. The great danger of the large-dose method, he says, is, "that the power of the heart may become so much impaired by its continuance, that the brain may soon be too sparingly supplied with blood, and general unmanageable prostration ensue, while at the same time the local congestion increases with the debility. * * * Like tartar emetic, and all other evacuants, ipecacuanha induces, when continued too long, the very state of vessels we find in inflammation,"—p. 290. He regards it as a remedy of great value in sthenic dysentery, to which it should be restricted. Here, too, I may refer to the cautious paper of H. CLARK—*On the use of ipecacuanha in dysentery*, The Indian Annals of Med. Science, Vol. VII, 1861, p. 553—who remarks that his own experience, "while it exhibits the favorable action of the ipecacuanha clearly enough, is, I think, inconsistent with the idea of its acting as a specific in dysentery," p. 557; and declares that he "should be sorry to rush to the conclusion that ipecacuanha is a medicine universally eligible in acute dysentery," p. 560. I may add that MOREHEAD—p. 298, *op. cit.*, p. 657, *supra*—while commending the use of ipecacuanha in dysentery, attributing its virtues, as PRINGLE did, to its "laxative or purgative effect," was by no means convinced of the justness of DOCKER'S enthusiastic views, remarking: "I regret this returning cycle of indiscriminate use and praise which is sure to lead to injurious reaction." On the other hand, however, Sir JAMES RANALD MARTIN—p. 461 *et seq.*, *op cit.*, v. 621, *supra*—has pretty fully endorsed the correctness of DOCKER'S views, and points out that he himself suggested the propriety of giving large doses of ipecacuanha in dysentery as early as 1837.

§ P. J. WARING—*Practical Therapeutics*, American reprint of the 2d Ed., Philada., 1866, p. 389. W. C. MACLEAN—p. 121, *op. cit.*, p. 657, *supra*: "Under the old system in Bengal the mortality among Europeans during the forty-two years, from 1812 to 1853-54, amounted to 88.2 in the thousand." In contrast to this he cites the figures of CORNISH and EWART, see note †, *supra*. He remarks: "It is probable that ipecacuanha owes much of its usefulness in this disease to its action as an evacuant. It is a blood depurant of an effective kind. It appears to increase the secretion of the whole alimentary canal, as well as that of the liver and pancreas; under its use tormina and tenesmus disappear, and feculent evacuations are more quickly restored than by any other known remedy. It also promotes free action of the skin, and exercises a sedative action on the circulation." "If unmanageable vomiting follows the use of ipecacuanha, hepatic complication of a serious kind may be suspected—or the vomiting may arise from the system being overcharged with malaria." AITKEN—p. 638, *op. cit.*, p. 647, *supra*.

‖ Among these I may note M'KIDD—*On the therapeutic effects of ipecacuanha in diarrhœa and dysentery*, Edinburgh Med. Jour., Vol. VII, 1861, p. 97—reports a case of chronic diarrhœa, cured, to the Med.-Chir. Society of Edinburgh. Remarks favorable to the use of ipecacuanha in diarrhœa and dysentery were made by W. BRIGHT, SPENCE and P. H. WATSON. WILLSHIRE—*Clinical lecture on a case of chronic dysentery treated with ipecacuanha*, The Lancet, 1862 Vol. II, p. 62. HILLIER—Med. Times and Gazette, 1864, Vol. I, p. 123—is said to have tried DOCKER'S method successfully in a child

forms, in which, however, Ward declares that after a fair trial in the Seamen's hospital he failed to satisfy himself of its efficacy.*

Although the method of Docker had been made known in the United States by several publications,† the use of ipecacuanha in large doses was not very extensively tested during our civil war. A few of the surgeons in the field resorted to it and reported favorable results,‡ but its trial in Eckington hospital, Washington, D. C., on a more serious class of cases, many of them chronic, terminated in disappointment,§ and like results are reported in the epidemic at Columbia, in South Carolina, in 1868.‖ I find, however, in the American medical journals several reports of the successful use of ipecacuanha, on the non-emetic plan, in sporadic cases of acute dysentery,¶ and even in chronic fluxes.** A number of similar cases are also reported in the monograph of Surgeon A. A. Woodhull, U. S. A.††

Meanwhile ipecacuanha has been employed to a certain extent in the treatment of dysentery on the continent of Europe. Its non-emetic administration is said to have had fair success during the late Franco-German war in the English hospital at Metz, as well as

four years old. He gave five minims of laudanum, followed in half an hour by 15 grains of powdered ipecacuanha. No nausea or other unpleasant symptom resulted. DYCE DUCKWORTH—*Obs. upon the action of ipecacuanha and its alkaloid emetia, Part II*, Saint Bartholomew's Hospital Reports, Vol. VII, London, 1871, p. 113—has also expressed the opinion that large doses of ipecacuanha may advantageously be resorted to in cases of chronic colitis. He reports, however, a case in which this treatment, although supplemented with enemata of ipecacuanha, was vainly tried: the patient "left the hospital but little relieved."

* STEPHEN H. WARD—*On the treatment of chronic dysentery*, Med. Times and Gaz., 1873, Vol. I. p. 194. His views are supported by the testimony of the senior resident physician of the same hospital, HARRY LEACH—*Clinical remarks on chronic dysentery*, The Practitioner, Vol. V, 1870, p. 350.

† See, for example, an abstract of DOCKER'S paper in the American reprint of *Braithwaite's Retrospect*, Part XXXVIII, 1859, p. 86; and an abstract of the paper of CORNISH—see note †, last page—published by E. H. JANES—Amer. Med. Times, Vol. III, 1861, p. 28—who expresses the opinion "that ipecacuanha is a valuable remedy in acute uncomplicated dysentery, if given boldly and continued at proper intervals until fæcal evacuations appear." So, too, RICHARD WHITTINGHAM, surgeon Peruvian navy—*On tropical dysentery*, The Amer. Jour. of the Med. Sciences, N. S., Vol. XL, 1860, p. 379—had strongly commended the use of ipecacuanha in large doses, both by the mouth and enema, in common and bilious specific dysentery, as the result of a four years experience in the general hospital at Callao, Peru. He administered by the mouth half a drachm to a drachm of powdered ipecacuanha, "not given as an emetic, but to produce its specific action on the disease." STILLÉ, in his paper circulated by the Sanitary Commission—p. 368, *op. cit.*, p. 650, *supra*—commended the administration of 25-30 grains of ipecacuanha for its emetic effect in the early stages of bilious dysentery, but also described WHITTINGHAM'S method. I may add that, if we can believe a note by A. P. MORRILL—*Ipecacuanha in dysentery*, The Med. and Surg. Reporter, Vol. XXIII, 1870, p. 503—the Brazilian method of successive infusions had previously been in common use in the southern states, [he says 50 years ago, which is probably an error of memory or a misprint for 30 years ago.]

‡ See, in Section II, the reports of BLADES—p. 91, *supra*—and MCELROY—p. 92, *supra*—who used with success large doses of ipecacuanha guarded by opium. I may add that COOPER—p. 93, *supra*—succeeded with frequent purging by castor oil, followed in the intervals by the free use of opium and ipecacuanha; while WALTON—p. 93, *supra*—found a mustard emetic, with or without ipecacuanha, cured half his cases of diarrhœa and BROWN—p. 81, *supra*—used an emetic of ipecacuanha combined with tartar emetic, "to unload the portal system." See, also, a paper by J. F. HAMMOND—*Brief account of dysentery as it occurred at Fort Jefferson, Tortugas, Florida*, Amer. Jour. of the Med. Sciences, Vol. XLIII, 1862, p. 63—who commends an emetic of ipecacuanha at the beginning of the disease. On the Confederate side, G. S. KING—*Ipecacuanha in dysentery*, The Med. Record, Vol. III, 1868, p. 43—reports that he used DOCKER'S plan with success in a number of cases in the Baptist College hospital, Richmond, Va. He never resorted to it, however, until other means had failed.

§ See, in Section II, the report of STORROW—p. 43, *supra*—and a paper by Acting Assistant Surgeon HENRY N. FISHER—*Remarks on chronic army diarrhœa*, Amer. Med. Times, Vol. VI, 1863, p. 4.

‖ See, in Section II, the report of COUES—p. 64, *supra*.

¶ The following report the successful treatment of cases of acute dysentery by DOCKER'S method: JOEL C. HALL, Vicksburg, Miss.—*The value of ipecacuanha in the treatment of acute dysentery*, The Med. and Surg. Reporter, Vol. XVIII, 1868, p. 144. DAVID W. YANDELL—*An abstract of a report of some cases of dysentery treated by large doses of ipecac.*, The Western Jour. of Med., Vol. IV, 1869, p. 473—who advises that the ipecacuanha should be guarded by morphia administered hypodermically, instead of by the preliminary dose of laudanum. JOHN STEPHEN—*Ipecacuanha in large doses in acute dysentery*, The Med. and Surg. Reporter, Vol. XXIII, 1870, p. 419. THOS. M. WOODSON—*Treatment of dysentery by large doses of ipecac.*, The American Practitioner, Vol. IX, 1874, p. 31—nine cases, in all but one of which, however, vomiting followed the use of the drug. M. LEWIS—*Clinical record of six cases of dysentery treated with ipecacuanha*, The Amer. Med. Weekly, Vol. III, 1875, p. 205. FOURNIER, READ and ROSS—*Proceedings of the Mobile Med. Society*, Virginia Med. Monthly, (Richmond,) Vol. II, 1875-6, p. 517. J. E. MORRIS—*Dysentery treated with ipecac.*, The New Orleans Med. and Surg. Jour., Vol. III, 1875-6, p. 356; also letter by *Alumnus of the University of La.*, from Danville, Ky., same Vol., p. 443. E. J. FORSTER—*Three cases of dysentery treated successfully by large doses of ipecacuanha given by the non-emetic plan*, Boston Med. and Surg. Jour., Vol. XCVI, 1877, p. 218. Success, with a modified method, is reported by A. A. HŒHLING, U. S. Navy—*Ipecacuanha in dysentery*, The Med. and Surg. Reporter, Vol. XIX, 1868, p. 327—in a case treated at Valparaiso, Chili, by the following mixture: R. Ipecacuanhæ 3ss, Manniæ 3j. Aquæ bullientis f3xij. Dose, f3ij, repeated every three hours till one dose was retained, and then suspended. This occurred after the sixth dose, when pills of camphor, ipecacuanha and opium were substituted.

** For reports of cases of chronic fluxes successfully treated with ipecacuanha, see the papers of H. D. BULKLEY—*On the use of ipecacuanha in chronic dysentery and diarrhœa*, Amer. Med. Times, Vol. IV, 1862, p. 64, and *Notes of hospital practice: Chronic dysentery*, The Medical Record, Vol. II, 1867-8, p. 489. His method was to give 10 grains three times a day. JAMES B. BURNET—*Cases of chronic dysentery treated with ipecacuanha*, The (N. Y.) Med. Gaz., Vol. I, 1868, p. 251—reports the successful use of the same method in the service of Prof. A. L. LOOMIS. Asst. Surgeon W. E. WHITEHEAD, U. S. A.—*Treatment of chronic dysentery with large doses of powdered ipecac.*, Pacific Med. and Surg. Jour., Vol. IV, 1870-1 p. 11—used essentially the same method, 8-15 grains three times daily.

†† A. A. WOODHULL—*Studies chiefly clinical in the non-emetic use of ipecacuanha, &c.*, Philadelphia, 1870, pp. 1-30—reports 28 cases of acute and chronic diarrhœa and dysentery successfully treated. This monograph is enlarged from a paper by the same author—*Clinical studies with large non-emetic doses of ipecacuanha*—originally published in the Atlanta Med. and Surg. Jour., Vol. XII, 1874-5, pp. 659 and 705, and reprinted in pamphlet form, Atlanta, Georgia, 1875.

in the hands of several of the surgeons of the besieging army.* Heubner approves the use of the drug, though only as an emetic, at the beginning of dysentery; but the plan of Docker has been warmly commended by Brunner.† In France the Brazilian method, as modified by Savignac, continues to be employed,‡ but has been replaced to some extent by the ipecacuanha enemata, which have also recently found much favor elsewhere, as will be related further on in connection with the subject of enemata.

It will be observed, therefore, that in the most modern times the use of ipecacuanha in the treatment of the fluxes has reëstablished the reputation it enjoyed in the seventeenth century, and is regarded in many quarters with a confidence as blind as that reposed in it by Piso or Helvetius. Nevertheless a little reflection must show the absurdity of expecting benefit from such a remedy either in acute diphtheritic dysentery after the formation of the diphtheritic layer, in the chronic fluxes after extensive ulceration has already occurred, or in those cases which owe their virulence to the coexistence of a scorbutic or some other constitutional taint. The value of the detailed clinical records of success or failure, which have been accumulated by the labor of more than two hundred years, is greatly impaired by the circumstance that no serious attempt seems to have been made, since the time of Degner,§ to discriminate the pathological conditions actually existing in the cases in which the drug has been tried; but it is easy to recognize, by the details of the majority of the successful cases recently recorded in the essays in which the virtues of ipecacuanha are most lauded, that they were sporadic, for the most part mild acute forms; and against the small number of chronic cases reported to have been successfully treated must be offset the contrary results, of the larger clinical experience, of the Eckington and Dreadnought hospitals.‖ We shall not, therefore, be surprised to find that the medical statistics of the British army in India since 1860 give, for certain years, results which by no means correspond with the agreeable picture drawn by Maclean from the statistics of Cornish and Ewart.¶ Indeed, I do not hesitate to express the opinion that really adequate statistics to

* *English hospital at Metz, December*, 1870, *January and February*, 1871, The Med. Times and Gaz., Vol. II for 1871, p. 358. The same statemen is made by HEUBNER—*loc. cit.*, next note. BRUNNER—*loc. cit.*, next note—mentions that its use was suggested by him to several of his colleagues in the besieging army who had employed it successfully.

† HEUBNER—S. 545, *op. cit.*, p. 529, *supra*. BRUNNER—*Zur Therapie der Ruhr*, Berliner Klinische Wochenschrift, Jahrg. XIII, 1876, S. 550—declares that he is inclined to regard ipecacuanha in large doses as "die wahre Panacee gegen die einfache nicht komplicirte Dysenterie."

‡ SAVIGNAC—pp. 345–346, *op. cit.*, p. 620, *supra*. The new formula is as follows: "Take 4 grammes of ipecacuanha in powder, boil five minutes in 500 grammes of water, filter and add 30 grammes of syrup of opium and 30 grammes of canella water," (hydrolat de cannelle, *i. e.*, the distilled water; the quantity of French syrup of opium named would contain a little less than 5 centigrammes of opium.) Dose a tablespoonful every hour, or at longer intervals if there is nausea or vomiting. He remarks: "I intentionally employ an abundance of the aqueous vehicle, for the more the ipecacuanha is diluted, the less it irritates the stomach, the less it produces vomiting, the better in fine it is tolerated in every way." SAVIGNAC is reported to have said at the meeting of the Société de Thérapeutique, March 25, 1874, that, in his opinion, "l'ipéca est le médicament par excellence de la dysenterie, de même que le quinine est le médicament des fièvres intermittentes," Bull. Gén. de Thérapeutique, T. LXXXVI, 1874, p. 331. The Brazilian method has recently been successfully used in the epidemic described by CZERNICKI—p. 138, *op. cit.*, p. 651, *supra*—who also gave a combination of ipecacuanha and calomel to the cases that did not yield to ipecacuanha alone, and in either event, after the steols were modified in character, used opium and bismuth.

§ See p. 693, *supra*. ‖ See notes §, and *, last page.

¶ MACLEAN—*loc. cit.*, p. 696, *supra*—says: "Under the old system in Bengal the mortality among Europeans during the forty-two years, from 1812 to 1853–54, amounted to 88.2 in the thousand. During 1860, when large doses of ipecacuanha were given to the almost complete exclusion of all other methods of cure, the mortality was 28.87 in the thousand." These figures are copied from EWART—*loc. cit.*, note †, p. 696, *supra*—in whose paper it will be seen that the ratio for 1860 does not refer to the whole number of cases and deaths of dysentery in Bengal that year, but only to those cases in which ipecacuanha was used; both sets of figures include chronic as well as acute cases. Now by referring to the official *Statistical, Sanitary, and Medical Reports for the year* 1860, Appendix, p. 185, it will be seen that the mean strength of her Majesty's European troops in Bengal that year was 42,571, among whom there were 2,589 cases with 159 deaths of acute, and 561 cases with 43 deaths of chronic, dysentery. This gives a total of 3,150 cases and 202 deaths, or 64 deaths per thousand cases. Of course it will be said that this greater mortality occurred because the majority of the cases were not treated with ipecacuanha. Admit it. What then shall be said of the year 1869, long after the general introduction of this vaunted specific? The official *Report for* 1870, Appendix, p. 613, shows that the mean strength of her Majesty's European troops in Bengal during 1869 was 35,173. The number of cases of dysentery was 1,648, the deaths 105, or 63.7 deaths per 1,000 cases; and it cannot be justly said that the disease in 1869 was more virulent than in 1860, for it will be observed that the ratio of cases to strength was considerably less in the former year than in the latter. Moreover, an examination of the statistics of the European troops in Bengal for individual years from 1812 to 1854—*Statistical report of the sickness and mortality among the fighting men of her Majesty's and the Hon'ble Company's European troops of the Bengal Presidency for* 42 *years*, &c., The Indian Annals of Med. Sci., Vol. IV, 1857, facing p. 266—shows that, although the average mortality from dysentery during that time was as stated above, there were nevertheless individual years, during the reign of calomel and the lancet, when the mortality was even smaller than that for 1860 or 1869: *e. g.*, in 1835, out of an aggregate strength of 11,364 men, there were 1,083 cases and 98 deaths from dysentery, being at the rate of 58 deaths per 1,000 cases; and in the year 1837, out of an

show the comparative value of the ipecacuanha treatment have yet to be collected, for in view of the varying mortality of the disease in different years, and especially in different epidemics, those hitherto brought forward cannot be seriously regarded as conclusive.

Considerable diversity of opinion exists with regard to the mode in which ipecacuanha acts, and better knowledge than we yet possess is desirable to guide its intelligent use in the treatment of the fluxes. While the older physicians for the most part gave it with a view to its emetic, purgative or diaphoretic action, modern attention has been turned away from these obvious and readily obtained effects to its more subtle properties, and especially it has become the fashion to give it in such a way as to avoid emesis as much as possible. Magendie (1817) found that when poisonous doses of emetia, the active principle of ipecacuanha, were administered to dogs a significant enteritis, extending from the cardiac orifice to the anus, was found after death, and the same results occurred when emetia was injected into the jugular vein, the pleural sac, the muscular tissue or given by enemata.* Similar anatomical lesions have more recently been observed by Duckworth, D'Ornellas and Polichronie,† in dogs poisoned by hypodermic injections of emetia, and by the first two of these observers in other animals also.

Pécholier, after poisoning rabbits with emetia given by the mouth, found the inflammation limited to the small intestine, and emphasized this circumstance in connection with the therapeutic use of ipecacuanha in dysentery; but the results on other animals indicate that this is merely an individual peculiarity of the rabbit.‡ Polichronie found that, while large doses of emetia proved speedily fatal by their action on the nervous system, smaller doses, which are supported for a longer time, produced still more profound lesions of the intestinal mucous membrane. Chouppe examined the intestinal mucous membrane of living dogs under the influence of emetia and, finding it dry and anæmic, suggested that this condition may be the primary effect of the first excretion of the poison by the intestinal mucous membrane, and the subsequent congestion and inflammation the consequence of its more abundant elimination.§ In fact the local irritant action of ipecacuanha and its alkaloid

aggregate strength of 11,908 men there were 1,478 cases and 91 deaths of dysentery, being at the rate of 62 deaths per 1,000. The experience of such individual years shows that other causes than the change of treatment must be invoked to explain the undoubted fact that the average frequency and fatality of dysentery is less since 1860 than before that date; and we shall not probably err if we conclude that those improvements in hygiene, which have led to the diminution in the frequency of the disease, have also determined its diminished severity and hence a diminished mortality. As a further indication of the sophistry of this attempt to support a doubtful opinion by incomplete figures, I may add that in the United States army during 18 years of peace terminating Dec. 31, 1859—see p. 323 of COOLIDGE's second report, cited p. 416, *supra*—out of an aggregate strength of 187,144 men there were 22,721 cases and 536 deaths of acute and chronic dysentery, or 23.6 deaths per 1,000 cases, a more favorable ratio than EWART's reports for cases treated with ipecacuanha, although that method had not yet been employed by any of our military surgeons.

* MAGENDIE et PELLETIER—*Rech. chimiques et physiologiques sur l'ipécacuanha*, Jour. de Pharmacie, T. III, 1817, p. 161. I note that H. C. WOOD—p. 409, *op. cit.*, p. 675, *supra*—remarks: "That the active principle is absorbed, and that the vomiting is so produced, is shown by the experiments of ORFILA"—*Traité de Toxicologie*, 5me Éd., T. I, 1852, p. 651—who, however, merely cites the experiments of MAGENDIE without adducing any of his own.

† DYCE DUCKWORTH—*Obs. upon the action of ipecacuanha and its alkaloid emetia*, St Bartholomew's Hospital Reports, Vol. V, 1869, p. 223; and the same, *Part II*, same reports, Vol. VII, 1871, p. 91. A. E. D'ORNELLAS—*Mémoire sur l'action phys. et thér. de l'émétine*, Gaz. Méd. de Paris, 1873, p. 550. C. A. POLICHRONIE—*Étude exp. sur l'action thér. et phys. de l'ipécacuanha et de son alcaloïde*, Paris Thesis, No. 411, 1874, p. 70 *et seq.*—obtained similar results after both rapid and slow poisoning.

‡ G. PÉCHOLIER—*Rech. exp. sur l'action phys. de ipécacuanha*, Paris, 1862, p. 28—also produced similar physiological effects in a rabbit with emetia absorbed by the skin—p. 23—but appears to have made no dissection in this case. So, too, D'ORNELLAS—*loc. cit.*, last note—found in rabbits poisoned hypodermically, that the vascular injection was limited to the stomach and small intestine. This circumstance is explained by an observation of DUCKWORTH—*loc. cit.* MAGENDIE and subsequent observers had noticed pneumonia as well as enteritis in dogs poisoned by emetia; DUCKWORTH found that "emetia produces most marked effects upon the lungs in the rabbit, and less upon the alimentary canal, while the reverse holds good for the dog, cat and Guinea pig." I may add that D'ORNELLAS—*loc. cit.*—found that in dogs the intestinal lesions extended further and further towards the lower extremity of the bowel the longer the time that elapsed between the administration of the fatal dose and death.

§ POLICHRONIE—p. 72, *op. cit.*—"intoxication chronique." CHOUPPE—*Étude exp. sur l'action de l'ipéca*, Le Progrès Médical, T. II, 1874, p. 424—concludes: "L'ipéca absorbé par quelque voie que ce soit, semble, au moment même de son absorption, produire une anémie avec sécheresse de la muqueuse intestinale. Peut être, si l'action du médicament se prolonge, éliminé en plus grande abondance par la muqueuse gastro-intestinale (ce qui resternit à prouver d'une manière irréfutable) que par les autres émonctoires, amène-t-il une congestion consécutive de cette muqueuse, congestion qui peut être portée au point de produire l'inflammation et des hémorrhagies." POLICHRONIE—p. 61 *et seq.*, *op. cit.*—obtained similar results, and adopts the same explanation. At the moment the substance begins to be eliminated it produces a local irritation that gives rise to a vascular contraction—p. 65—which in its turn is followed by congestion and inflammation—p. 70.

is well established by observation,* so that, if it were proven by experiment that emetia introduced into the circulation is actually eliminated by the alimentary mucous membrane,† the occurrence of these local inflammations after its hypodermic injection would be quite intelligible; and it would be readily understood, also, why they should occur more promptly and with greater intensity when the drug, or its alkaloid, is administered by the mouth.‡

Besides these functional and organic lesions of the alimentary canal, the administration of poisonous doses of emetia to animals is promptly followed by grave nervous phenomena. The animal speedily falls into a condition of profound prostration; voluntary motion rapidly diminishes and is soon abolished; reflex action becomes progressively feebler, and death occurs, often preceded by convulsions and paralysis.§ In doses not large enough to prove fatal the prostration is of brief duration and proportioned in degree to the dose,‖ but the effect when observable is always one of depression, and never justifies the assumption of a stimulant action. Experimenters are in accord as to these facts, but differ considerably as to their interpretation. How far the depression results from the gastro-intestinal disturbances;¶ how far it is the consequence of a direct action of the poison in the blood upon some part of the nervous system, and on this latter supposition whether the sensitive or the motor nerve fibres,** the pneumogastric nerves,†† or some portion of the central nervous system‡‡ are immediately affected,—these are interesting questions which have been by no means settled by the experiments hitherto reported.

The phenomena of nervous depression are accompanied by diminished temperature, at least of the surface of the body; but the temperature indicated by a thermometer introduced into the rectum is increased, which D'Ornellas ascribes to the irritated or inflamed condition of the intestinal mucous membrane.§§ The number of respirations is usually, but not always, diminished by poisonous doses of emetia, and it is generally by putting an end to this function that the drug proves fatal, if the animal does not live long enough to

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* Especially may I cite the paper of DUCKWORTH—*Part II*, p. 102 *et seq.*, *op. cit.*—who produced inflammation of the conjunctiva and prepuce by the local effects of emetia, of the former also by ipecacuanha, and a pustular eruption of the skin by a liniment composed of ipecacuanha, lard and olive oil. PÉCHOLIER—p. 41, *op. cit.*—produced conjunctivitis in rabbits, and D'ORNELLAS—p. 550, *op. cit.*—in dogs, by introducing powdered ipecacuanha into the eye. The latter observer obtained a similar effect by a solution of emetia.

† The experiments in this direction are by no means conclusive. D'ORNELLAS—p. 551, *op. cit.*—prepared an alcoholic extract of the stomach, intestines and their contents, from a dog poisoned by emetia given hypodermically, and found that when this was injected under the skin of pigeons vomiting and death followed. Unfortunately, POLICHRONIE—p. 93, *op. cit.*—obtained the same results with an alcoholic extract of the stomach of a dog not so poisoned.

‡ This seems probable from the observations of D'ORNELLAS—p. 575, *op. cit.*—who found that it required a larger dose and longer time to produce vomiting when the alkaloid is administered hypodermically than if it be introduced into the stomach.

§ MAGENDIE—*loc. cit.*—described the condition of the poisoned animal as one of sopor, "assoupissement," but this is hardly accurate. The phenomena are described in detail by PÉCHOLIER—p. 42, *op. cit.*—DUCKWORTH—*Part I*, p. 222, *op. cit.*—and D'ORNELLAS—pp. 538, 549 and 552, *op. cit.*

‖ Speedy recovery from great prostration was observed especially by PÉCHOLIER—*loc. cit.*—in rabbits.

¶ Thus DUCKWORTH—*loc. cit.*—remarks: "A decidedly sedative effect is rapidly induced. Magendie observed a disposition to sleep, but I doubt if there is truly a soporific action in poisonous doses; more probably there is a condition akin to, if not identical with, collapse, and this is rendered not unlikely because of the profound impression made on the abdominal nerve centres through the severe gastro-enteric irritation." I may mention here that both PÉCHOLIER—*loc. cit.*—and D'ORNELLAS—*loc. cit.*—record that the administration of a hypodermic dose of emetia is immediately followed by what might be taken, on superficial examination, for a period of excitation; the animal on being let go runs around wildly. This condition, however, is succeeded in a minute or two by the proper effect of the drug, which is always sedative. The latter observer, with apparent reason, attributes this momentary excitement merely to fright.

** PÉCHOLIER—p. 47, *op. cit.*—concluded from experiments on frogs that the paralysis chiefly affected the sensitive nerves, while those of the motor nerves and the contractility of the muscles, though diminished, are not abolished. On the other hand, D'ORNELLAS—p. 539, *op. cit.*—also from experiments on frogs, concluded that the activity of the sensitive nerves is not at all diminished.

†† There seems to be no doubt that section of the pneumogastric nerves before the administration of emetia in most cases prevents vomiting from occurring—DUCKWORTH—p. 223, *op. cit.*—D'ORNELLAS—p. 552, *op. cit.*—POLICHRONIE—p. 86, *op. cit.*; but it does not seem to prevent the gastro-intestinal inflammation or other actions of the poison—D'ORNELLAS—*loc. cit.* See the discussion of the supposed action of emetia on the pneumogastric nerve in these passages.

‡‡ POLICHRONIE—p. 91, *op. cit.*—injected five centigrammes of a 10 per cent. neutral solution of emetia into the carotid artery of a dog without producing vomiting or any other disturbance. Next day he repeated the dose with the same result. He concluded, hence, that emetia has no direct action on the central nervous system by which emesis can be produced. I should be sorry to conclude anything from this single experiment, except that, perhaps, the dose was too small for that particular dog. Nor is much importance to be attached to the fact that both PÉCHOLIER—p. 42, *op. cit.*—and DUCKWORTH—p. 222, *op. cit.*—failed to find anatomical lesions of the central nervous system in animals dead of emetia poisoning.

§§ The fall of surface temperature and rise of rectal temperature are recorded by PÉCHOLIER—p. 35, *op. cit.*—DUCKWORTH—*Part I*, p. 222, *op. cit.*—and D'ORNELLAS—pp. 550-1, *op. cit.* The latter observed, however, that the temperature of the rectum fell first and afterwards rose.

die of the gastro-intestinal lesions.* Still more uncertain is the effect upon the circulation; the pulse is even less frequently retarded than the respiration; no definite modification of the blood pressure has been demonstrated, and the speculation that vaso-motor spasm is produced has not been supported by experiment.† Albuminuria is an occasional accident ‡ Finally, the experiments of Rutherford and Vignal seem to show pretty conclusively that the quantity of the hepatic secretion in dogs is increased by the internal administration of ipecacuanha, certainly a most significant circumstance.§

A consideration of these observations on animals should at least serve as a warning of the danger of recklessly persisting in the administration of large doses of ipecacuanha to patients whose intestinal mucous membrane is already inflamed. That even more moderate doses too long continued may provoke serious intestinal lesions seems likely from the observations of Polichronie on chronic emetia intoxication in dogs;‖ so that Blacklock was probably right in speaking of an "ipecacuanha dysentery"¶ as the result of the abuse of this drug in the treatment of the fluxes. Evil consequences of this kind are particularly to be feared from the non-emetic use of ipecacuanha, in which the natural irritability, that would otherwise have expelled the poison from the system, is blunted by the use of morphia. The effects of the medicine upon the bowels, when repeated doses are given in this manner, should always be jealously watched.

Nevertheless the experiments on animals would seem to indicate several ways in which ipecacuanha may prove beneficial to patients laboring under the fluxes, if administered with sufficient caution. The serious perturbation it excites in the intestinal mucous membrane may, when not more than one or two large doses are given at the beginning of the disease, be followed by a beneficial reaction. The experiments show that the effects of such doses are quite transitory, and no serious injury is therefore to be expected from them unless the quantity is large enough to prove immediately poisonous.** It is possible also that repeated doses, provided they are too small to add to the existing inflammation,

* Diminished frequency in the respirations was observed by PÉCHOLIER in rabbits—p. 32, *op. cit.*—by D'ORNELLAS in frogs—p. 538, *op. cit.*—rabbits—p. 550—and dogs—p. 551. DUCKWORTH, on the other hand—*Part I*, p. 220, *op. cit.*—found the respiratory movements increased in frequency. In several of his experiments the animals are said to have died of cardiac paralysis; but D'ORNELLAS found—p. 538, *op. cit.*—that in frogs the heart continued to beat for some time after the respiration had ceased. POLICHRONIE—p. 96, *op. cit.*—remarks that emetia kills in two ways: "Sometimes by the considerable prostration it produces in the nervous system, sometimes when it is given in smaller doses by the intense enteritis it provokes." According to MAGENDIE, DUCKWORTH and D'ORNELLAS, the lungs are generally found congested or actually inflamed, while in the rabbits poisoned by PÉCHOLIER they were always quite nnæmic. See note ‡, p. 699, *supra*.

† According to PÉCHOLIER—p. 28, *op. cit.*—the usual effect of the poison is to diminish the frequency and energy of the cardiac pulsations, but D'ORNELLAS—p. 575, *op. cit.*—found this effect less constant than the diminished frequency of the respiration, and DUCKWORTH—*loc. cit.*—found in his experiments that "the cardiac action was not less rapid than in health." Both this author—*Part II*, p. 96—and D'ORNELLAS—*loc. cit.*—failed to establish any modification in the blood pressure. The question of vaso-motor spasm has been investigated especially by POLICHRONIE—p. 61 *et seq.*, *op. cit.*—who concludes "son action vaso-motrice est nulle,"—p. 70.

‡ DUCKWORTH—*Part I*, p. 224, *op. cit.*—states that albuminuria is of frequent occurrence in emetia poisoning, but PÉCHOLIER—p. 40, *op. cit.*—vainly examined the urine of his rabbits for either sugar or albumen.

§ RUTHERFORD and VIGNAL—*Experiments on the biliary secretion of the dog. Second series*, The Jour. of Anat. and Phys., Vol. XI, 1876, p. 71 *et seq.* The quantity of the biliary secretion was increased in these experiments, but analysis showed that "the percentage amount of the special biliary constituents remains unchanged." In two of these experiments 60 grains of ipecacuanha powder were introduced into the duodenum, in two of them only 3 grains, (but these were smaller dogs.) "No purgative effect was produced, but there was an increased secretion of mucus in the small intestine." D'ORNELLAS—p. 551, *op. cit.*—affirmed that the liver, as well as the intestines, eliminates emetia; but conclusive evidence on this head is wanting.

‖ POLICHRONIE—see note §, p. 699, *supra*. This author has himself drawn this lesson from his experiments. He remarks, p. 83. "Diseases which in themselves are not mortal become so if they are repeated daily for a sufficient time. It will be understood that the number of days will vary with the dose and with the resisting power of the animal. This is an important point to establish in therapeutics, for it shows us that, small as may be the quantity of emetia absorbed from ipecacuanha enemata, it is always necessary to watch the patient and suspend the medicine on the appearance of the first symptoms of enteritis."

¶ BLACKLOCK—see note ‡, p. 696, *supra*.

** An instructive illustration of this possibility has recently been reported—*A case of ipecacuanha poisoning*, The Calcutta Journal of Medicine, Vol. VII, 1874, p. 447. A native student of medicine, aged 23, took about 35 grains of powdered ipecacuanha as an emetic to relieve acidity of the stomach. It was followed by excessive nausea, vomiting and purging, with gripping pains in the abdomen, cramps in the fingers of both hands, in the right toe and the calves of the legs. Stiffness in the neck ensued, followed by irregular spasmodic contractions of both upper and lower extremities. There was great prostration and coldness of the extremities; the pulse became soft, weak and slow; the stools were greenish or greenish-yellow and contained a good deal of floating white mucus; for a time they were passed involuntarily. The patient recovered. The treatment consisted in the administration of chlorodyne, and of a stimulant mixture containing chloric ether and aromatic spirits of ammonia.

may exercise a wholesome alterative effect upon the intestinal mucous membrane. The action of the drug in increasing the hepatic secretion would also appear to be of great importance in connection with the treatment of the fluxes. This effect has been for some time suspected from the frequency with which the administration of ipecacuanha in dysentery is followed by a prompt improvement in the character of the stools, a circumstance also explained by supposing the drug to relax an imaginary spasm of the biliary ducts.*

Moreover, the sedative action of ipecacuanha, as manifested by its power of sometimes reducing the temperature and diminishing the frequency of the pulse,† indicates for it a certain degree of possible usefulness in those cases of acute dysentery in which the temperature is high and the pulse frequent at the commencement of the disease. But in administering it in these or other cases its tendency to depress the vital powers should never be overlooked. Erroneous views on this subject have prevailed in certain quarters. Already Piso‡ imagined ipecacuanha to exercise a tonic influence upon the viscera. Higginbottom in 1814 ascribed to it general tonic, stimulant and restorative properties, and reaffirmed these views as late as 1869.§ A similar opinion was for a long time held by some of the physicians of the school of Montpellier,‖ and notwithstanding the general discredit into which it has fallen, it has recently been earnestly advocated by my colleague, Surgeon A. A. Woodhull, U. S. Army.¶ Such speculations are at variance with the obvious teachings of clinical experience, which, in this matter, is fully in accord with the experiments on animals and on the healthy human subject.

* Among those who have affirmed that ipecacuanha possesses a cholagogue action, I may particularly mention EWART—see note †, p. 696, *supra*. RUTHERFORD and VIGNAL—p. 74, *op. cit.*, last page—remark: "It is stated that it gives rise to evacuations containing a large quantity of bile. The manner in which it does this is not definitely known; some maintaining that it permits of biliary discharge by relieving spasm of the bile-ducts." It is worthy of note that in the experiments of these authors the effect of ipecacuanha in increasing the secretion of bile is somewhat greater than that of sodium sulphate, sodium phosphate or other neutral salts found by them to possess a cholagogue action; see Table II, p. 661, *op. cit.*

† D'ORNELLAS—p. 575, *op. cit.*—gave to a healthy man a subcutaneous injection of emetia in dose insufficient to provoke vomiting, and observed diminished frequency of the pulse and respiration, with lowered temperature both in the rectum and on the surface. Emetia was administered to patients laboring under various diseases; in whatever way it was introduced, and whether it produced vomiting or not, he found that the reduction of temperature in the axilla and retardation of the respiration and pulse were not constant. The respiration was retarded in the majority, the pulse in about half the cases; both effects being especially noted in patients suffering with inflammatory affections of the respiratory organs. The rectal temperature was always accelerated. He concluded that "emetia is neither a vascular tonic, nor a depressor of the circulation, but an irritant of the intestinal tube and a despoiler (un spoliateur) of the blood; it acts by revulsion and spoliation," (evacuation?)

‡ PISO—see note *, p. 692, *supra*—supposed ipecacuanha to exercise a tonic influence on the intestines in consequence of its alleged astringent action, "sed et astringendo viscerum tonum restituat." The astringent action of ipecacuanha does not, however, appear to be very marked. Whatever there is seems to be due to the presence of a small quantity of ipecacuanhic acid, a body belonging to the tannic acid group; see E. WILLIG—*Ueber die Wurzel der Cephaëlis Ipecacuanha*, Chemisch-Pharm. Central-Blatt, 1851, S. 55.

§ CADE—p. 251, *op. cit.*, *infra*—writes: "Cette propriété de l'ipécacuanha avait été reconnue par un médecin anglais, M. Higgiobottom, in 1814. L'ipécacuanha, dit le médecin anglais, possède une propriété tonifiante ou excitante, entièrement opposée à l'action dépressive ou antiphlogistique du tartre stibié." I have not seen any publication of J. HIGGINBOTTOM of the date mentioned, but in 1845 he published a paper on *Ipecacuanha in emetic doses as a powerful restorative in some cases of exhaustion and sinking*, The Lancet, 1845, Vol. I, p. 732, in which he relates that in 1814 he was "first led to see the extraordinary beneficial effects of ipecacuanha as an emetic, in a female forty years of age, who was in a sinking state, in the last stage of cholera," (cholera morbus!) He gave her a scruple of ipecacuanha, and she recovered. He now relates cases of uterine hæmorrhage, bronchitis, suspended animation and sinking during the puerperal state, all cured by ipecacuanha in emetic doses. His views as to its mode of action are sufficiently indicated by the title of the paper. In a later publication—*Ipecacuanha in emetic doses: as a stimulant, restorative, eliminative, and adjuvant in various cases of disorder and disease*, The British Med. Jour., 1869, Vol. 1, p. 143 *et seq.*—he remarks: "The action of an ipecacuanha emetic excites the whole nervous, vascular, and respiratory systems, consequently the heart, the lungs, and the skin; and increases the action of the stomach, intestines, and liver; it acts also as a tonic stimulant to the general capillary organisation, so as to restore and produce a more normal state of the secreting and assimilating organs." He declares that it does not produce "any debility," but that on the contrary he has "often seen the effects in raising quickly the sinking powers of the system in extreme cases of syncope, hæmorrhage, etc." Illustrations of its beneficial effects in "English cholera," fever, erysipelas, bronchitis, tic douloureux, periodical drunkenness, delirium tremens, indigestion, intestinal irritation, suspended animation, exhaustion during the puerperal state, old age, (!) syncope senilis, uterine hæmorrhage and ophthalmia, complete this singular essay.

‖ As to the prevalence of this opinion among the Montpellier physicians, we have the testimony of PÉCHOLIER—p. 8, *op. cit.* A pupil of the Montpellier school, CADE—*De l'ipécacuanha dans la fluxion de poitrine muqueuse*, Bull. Gén. de Thér., T. L, 1856, p. 251—has strikingly formulated these views, contrasting the action of ipecacuanha especially with that of tartar emetic: "Tartar emetic is antiphlogistic, while ipecacuanha in infusion is tonic;" and again: "It is by elevating (en relevant) the tone of the economy, and especially of the lung, that ipecacuanha provokes the absorption of that sanies, 'serum acre, subtile, malignum, efferum, eludens exclusionis ansam, et pepasmi occasionem, a quo siderantur pulmones derepente,' which hepatizes the lung."

¶ Surgeon WOODHULL in his first paper—p. 49, *op. cit.*, p. 697, *supra*—expressed his views in these words: "I therefore regard ipecacuanha as a peculiar but direct nervous stimulant, acting chiefly and probably entirely through the medium of the sympathetic system." The same opinion is expressed in his later work—p. 91, *op. cit.*, same note—where his argument appears to be, that, as ipecacuanha is beneficial "in dysentery, in some of the choleraic forms of intestinal disease, in nervous vomitings, in passive hemorrhages and in intermittent fever," and as "No one will seriously maintain that the indications in these diseases are for depression, and no violence is done to any known physiological or pathological fact in supposing that each of these morbid states may acknowledge a loss of nervous control as its efficient pathological cause. It must follow that the restorative agent is a counter-

The foregoing considerations seem to indicate that the use of ipecacuanha in the fluxes should be limited to vigorous patients suffering with acute catarrhal diarrhœa or dysentery, or with the preliminary catarrhal stage of diphtheritic dysentery. It may perhaps be occasionally useful in the chronic fluxes, but only if there is no ulceration, or if the ulcers are of very moderate extent. It is contraindicated in all exhausted and debilitated patients, and whenever there is conclusive evidence that extensive intestinal lesions already exist. As to the mode of using it, I confess I feel little confidence in small doses frequently repeated, and favor the employment of a single dose of fifteen to thirty grains, according to the vigor of the patient, to be repeated, if deemed necessary, once or at most twice at intervals of twenty-four hours; but I am by no means satisfied, by the evidence hitherto brought forward, that the non-emetic administration of large doses offers any advantages over the old method which secured also its effects as an evacuant. In many of the cases published to illustrate the success of the non-emetic plan it will be noticed that emesis was unintentionally produced without appearing to vitiate the benefits claimed.* Finally, it is worthy of consideration whether emetia may not be substituted for ipecacuanha in the treatment of the fluxes. Some successful attempts in this direction have already been published,† but further studies are desirable.‡

PURGATIVES.—Mild purgation for the purpose of evacuating the peccant humors from the alimentary canal in cases of flux is quite in accordance with the humoral pathology; but the Greek physicians appear for the most part to have relied upon diet and the mildest laxatives for this purpose, and to have avoided the perturbing effects of drastic cathartics. White hellebore, indeed, which had a certain vogue as an emetic, also operated as a purgative, and had its advocates; but the great authority of Galen was thrown against the use of purgatives in the treatment of the alvine fluxes.§ The Arabian writers taught the

depressant, is a stimulant," p. 121, *op. cit.* Such a view as this not only requires that those who hold it should, like my colleague, make light of the results of experiments on animals or observations as to the action of the drug on healthy human beings—see p. 122, *op. cit.*—but is equally at variance with all that we know of the obviously depressing effects of ipecacuanha when administered in sufficient dose to the sick. It will not do to conclude that any medicament is a stimulant merely because patients frequently recover after its administration. I may add that in the interesting monograph just cited, examples are brought forward of apparent benefit from the non-emetic use of ipecacuanha in acute and chronic dysentery, chronic diarrhœa, painful but simple intestinal affections, cholera morbus and cholera infantum, uterine and other hæmorrhages, excessive perspiration, some forms of dyspepsia, vomiting of pregnancy, asthma and nervous cough, drunkenness and delirium tremens, opium poisoning, neuralgia, intermittent fever, pneumonia, the puerperal state, acute hepatitis, as an antidote to venom, and as a local application (of the infusion) in conjunctivitis. The disposition to laud the effects of ipecacuanha in a multitude of affections is, however, by no means new, as may be inferred from a remark of PÉCHOLIER—p. 7, *op. cit.*—who, after speaking of its alleged specific virtues in dysentery and puerperal fever, adds: "L'empirisme ne s'arrêta pas là, et la liste de toutes les maladies auxquelles on a prétendu donner l'ipécacuanha pour spécifique, tiendrait ici pas mal de place, si elle n'était trop inutile pour nous arrêter un moment. Citons seulement, dans cette liste, la peste, le tænia, et, d'après Thomson et Cullen, la fièvre intermittente."

* Thus WOODHULL reports—p. 23, *op. cit.*—that even in his own hands vomiting occurred after 10 out of 54 doses given to twenty-six cases "of dysentery or strongly marked dysenteric diarrhœa."

† Thus, according to DUCKWORTH—*Part II.* p. 112, *op. cit.*—Mr. WM. S. ECCLES treated successfully 26 cases of dysentery and 9 of aggravated diarrhœa with emetia. (This was in the Bombay Presidency previous to July, 1869.) "It was always given according to the following formula: Emetiæ gr. iij, morphiæ hydrochloratis gr. ij, sacchari albi gr. xiij, m. ut fiat pulvis. Div. in chartulas vi." See also the remarks of D'ORNELLAS on the administration of emetia in disease—*loc. cit.*, note †, p. 702, *supra*.

‡ I must refer the reader to the works on materia medica, especially that of FLÜCKIGER and HANBURY—*Pharmacographia*, London, 1874, p. 331—for a description of the several varieties of ipecacuanha. Only the root of the cephaëlis ipecacuanha is recognized in the United States Pharmacopœia of 1870. It is worthy of note that, according to so trustworthy an authority as Dr. E. R. SQUIBB, of Brooklyn, much of the powdered ipecacuanha sold in the United States is adulterated. Surgeon WOODHULL—p. 124, *op. cit.*—quotes him as writing, November 11, 1874: "There is very much ipecac. now in the market that is of very doubtful character. It is a large size root, produced in the West Indies, is cheap, and is used either as a substitute or adulterant of the true Rio ipecac. Perhaps half the powdered ipecac. sold may be made from this variety." As this page passes through the press I note the recently reported experience of AUSTIN FLINT—*Diseases of the Alimentary Canal*, (a lecture,) The Medical Record, Vol. XIV, 1878, p. 202—that "in the larger proportion of cases the ipecac. treatment fails."

§ In the Hippocratic treatise *De Affectionibus*—*loc. cit.*, note *, p. 689, *supra*—it is advised that after the administration of hellebore as a phlegmagogue-emetic, and the use of enemata of boiled milk, the bowels should be continually disembarrassed of their contents, provided there is no fever, by the use of unctuous, fat, sweet and moist substances. On the use of fresh vegetables and fruits in dysentery, for their laxative virtues, by the Greek physicians, especially by ALEXANDER OF TRALLES, see p. 678, *supra*. According to CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 6, p. 526, edition cited p. 684, *supra*—PRAXAGORAS resorted to purgatives in dysentery, using for this purpose sea-spurge (peplium) with milk and hydromel, (mulsum,) also copious draughts of salt water and the juice of the beet and oil with hydromel, (mulsum.) AËTIUS states—in AËTIUS, Tetrab. III, Serm. 1, Cap. 37, p. 599, edition cited p. 656, *supra*—that certain physicians use purgation by hellebore (veratrum album) in the treatment of the cœliac flux, and that if the strength of the patient be such that the remedy is well borne, it is advantageous above all other remedies. ALEXANDER OF TRALLES—Lib. VIII, Cap. 9, p. 457, edition cited p. 624, *supra*—commends the use of purgation in ulcerative dysentery, when the ulcers are seated in the middle intestines; but it should be employed cautiously, a little at a time. As especially suitable, he mentioned the antidote Theodoretus, (a mixture of

greatest moderation in this matter. According to Avicenna, purgation is sometimes advisable in the treatment of dysentery, but it should be employed with fear and caution, and the mildest substances should be selected; he particularly specified *myrobalans* as suitable for this purpose.* This drug, with two others introduced by the Arabians, *tamarinds*† and *rhubarb*,‡ subsequently acquired great renown in the treatment of dysentery, and their high reputation led to a much more liberal use of purgatives than had been practiced by the ancients. Those of the physicians of the sixteenth and seventeenth centuries who disapproved of bloodletting and emetics, commenced the treatment of dysentery by a purge; those who bled or vomited, followed these preliminary measures by purgation, which was subsequently resorted to at intervals during the progress of the disease. It was generally admitted that violent drastic cathartics were objectionable, and likely to add to the intestinal inflammation; mild laxatives, especially such as produce a subsequent astringent effect, were to be preferred.

Of the three drugs just named *rhubarb* was most frequently employed. To give greater prominence to its astringency by diminishing its purgative action, some advised that it should be torrefied, and a sharp controversy arose as to the precise effects of this

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cassia and aloes with various aromatics, &c.: see PAULUS ÆGINETA—Lib. VII, Cap. 11, Vol. III, p. 520, edition cited p. 624, *supra*—) either given alone or combined with tears of scammony; also well washed aloes, if it is desired to strengthen the liver. Compare the remarks of ACKERMANN—Lib. II, Cap. 2, p. 133, *op. cit.*, p. 620, *supra*—on the use of laxatives by the ancients in the treatment of dysentery. GALEN—*Ad Glauconem de Medendi Methodo*, Lib. I, Cap. 15, [Ed. Kühn, XI, 43,]—declared that if a patient has fever accompanied with an alvine flux, he will be exposed to great danger if he be bled or purged. He preferred to wash out the acrid juices from the intestines by bland enemata prepared from honey and barley. "Mordacibus succis in intestinis contentis eluentia quum prius per ioferiores partes immiscrimus, inter quæ mulsa est, ptisanæ eremor et excreta hæc fuerint, morsus deinde mitigantia et quæcunque inhærentia et intestinorum tunicas operientia superne incidentes mordaces humores arcent, in sedem damus," *Comm. VI, in Hippoc. Epidem.*, VI, § 5, [Ed. Kühn, XVII, B, 329.] The objections of GALEN to any active medication in the treatment of dysentery are strikingly expressed in the treatise *Methodus Medendi*, Lib. XII, Cap. 1, [Ed. Kühn, X, 815.] where he relates that a certain physician who adopted too vehement a plan of medication, although he cured many, killed some of his patients. MOSELEY—p. 295, *op. cit.*, p. 648, *supra*—appears to think that this treatment consisted in giving "raw onions and bread, the patient drinking but little, and the next morning glysters of the sharpest pickle;" but GALEN expressly adds that after the clyster, the rash physician employed a certain "powerful medicine," (*φάρμακον ἰσχυρόν,*) the nature of which he does not state.

* AVICENNA—Lib. III, Fen 16, Tract. 2, Cap. 7, p. 823, edition cited p. 632, *supra:* "Et si fuerit necessaria evacuatio propter malitiam humoris, fac eam cum timore, et cautela. Et studc ut sit solutivum non vehementer nocivum vestigio, et ulceri, imo sit sicut myrobal." Myrobalans were unknown to the Greek physicians. Under this designation several varieties of stone fruits of East Indian and Chinese origin were included: See the commentary of ADAMS—Vol. III, p. 440, of the edition of PAULUS ÆGINETA, cited p. 624, *supra*. They were highly esteemed by the Arabists (*e. g.*, GORDONIUS—*loc. cit.*, p. 680, *supra*) and the physicians of the sixteenth and seventeenth centuries, (see most of the authors cited in note *, next page,) but went gradually out of use during the eighteenth century, and have now long been abandoned.

† Tamarinds also were introduced by the Arabians. According to AVICENNA—Lib. II, Tract. 2, Cap. 699, p. 404, Ed. cited—they are of a cold and dry nature, and have a laxative effect which gently purges yellow bile. They are advantageous in vomiting, as a cooling drink in fever, and in hot intemperaments of the liver: See Lib. III, Fen 14, Tract. 1, Cap. 21, p. 756, *op. cit.* Compare the commentary of ADAMS, Vol. III, p. 439, *op. cit.*, last note. Although some physicians, like FORESTUS—*loc. cit.*, p. 680, *supra*—objected to them as of doubtful value in dysentery, they long enjoyed great popularity. They figured conspicuously in the therapeutics of ZIMMERMANN—*vide infra*—and were still much used in the early part of the present century. Of late they have been seldom employed in the treatment of the fluxes.

‡ According to ACKERMANN—Lib. II, Cap. 2, p. 134, *op. cit.*, p. 620, *supra*—rhubarb was already known to ALEXANDER OF TRALLES and PAULUS ÆGINETA, but according to most modern commentators this is probably erroneous. ALEXANDER OF TRALLES—Lib. VIII, Cap. 3, p. 401, *op. cit.*, p. 624, *supra*—indeed mentions "rheum barbaricum" as a remedy for dysentery from imbecility of the liver, but only for its alleged astringent effects. In like manner the chapter of PAULUS ÆGINETA—Lib. VII, Cap. III, Vol. III, p. 316, edition cited note *, *supra*—on Ῥῆον, describes an astringent substance, and says nothing of any purgative effect produced by it. Hence there is much probability in the opinion of ADAMS—Vol. III, p. 479, *op. cit.*—that the rheum rhapontieum or culinary rhubarb was alluded to in these passages. On the other hand, however, PAULUS in another passage—Lib. I, Cap. 43, Vol. I, p. 54, *op. cit.*—distinctly recognizes the purgative properties of rhubarb. AVICENNA—*loc. cit.*, note *, *supra*—remarks: "Et reubarbaro quidem inest proprietas mirabilis in ulceribus intestinorum," but this passage occurs in connection with remarks on astringent and styptic remedies; and in his account of "reubarbarum"—Lib. II, Tract. 2, Cap. 585, p. 383, *op. cit.*—he makes no mention of any purgative action from its use. Several of the purgative varieties of rhubarb are, however, described by EBN BAITHAR—I cite the German translation of J. v. SONTHEIMER, *Grosse Zusammenstellung über die Kräfte der bekannten einfachen Heil-und Nahrungsmittel von Abu Mohammed Abdallah Ben Ahmed aus Malaga, bekannt unter den Namen Ebn Baithar*, Stuttgart, 1840, Bd. I, S. 478—who remarks: "As to what concerns the purgative action of this root, it was not noticed by a single one of the older physicians, and no one stumbled upon it until finally more modern physicians appeared who, living nearer our time, acquired a knowledge of it. These were especially inhabitants of our own country," S. 484. (EBN BAITHAR is said to have died in the year 1248.) He affirms that rhubarb is useful in chronic diarrhœas arising from obstructions of the abdominal viscera, and in dysentery; in the latter disease, however, it should be associated with other ingredients to restrain its purgative and increase its astringent and healing powers: See further, on the history of the introduction of rhubarb, the commentary of ADAMS—*loc. cit.*—and the *Pharmacographia* of FLÜCKIGER and HANBURY, London, 1874, p. 442. Another purgative introduced by the Arabians was senna: see the exceedingly interesting treatise of CARL MARTIUS—*Versuch einer Monographie der Sennesblätter*, Leipsic, 1857; also the *Pharmacographia*, p. 189. It has, however, been used in dysentery chiefly as an adjuvant to other purgatives, especially the saline cathartics. Here, too, I may mention manna, the concrete juice of the fraxinus ornus and the f. rotundifolia. The name was given by the Greek and Arabian physicians to other substances, and our modern manna appears first to have been collected in Calabria in the fifteenth century: see DANIEL HANBURY—*Historical notes on manna*, Pharmaceutical Jour and Trans., Vol. XI, 1869-70, p. 326. It has been used in the fluxes chiefly in combination with senna or other cathartics. DUFROULAU—p. 569, *op. cit.*, p. 618, *supra*—however, used it with whey in place of other purging medicine, giving daily, for several days, 30 grammes of manna in 500 grammes of whey.

modifying process, as to how far it should be carried, and whether it was really desirable.* The popularity of this drug continued during the early part of the eighteenth century;† and Degner went so far as to claim for it the possession of specific powers in bilious diarrhœa and dysentery; he declared that it was a divine rather than a human remedy, and affirmed that it excelled all other purgatives as much as ipecacuanha excelled other emetics.‡ This was the culmination of the renown of rhubarb in the treatment of dysentery; a few practitioners continued to rely upon it;§ Pringle, Macbride and Geach combined it with calomel to increase the certainty and ease of its operation;‖ but the general use of the drug had brought into notice various inconveniences. Baker pointed out that its action was often tardy, insufficient, accompanied by an increase of the tormina; and condemned its use altogether, especially at the beginning of the disease;¶ Zimmermann, although he admitted that it was of singular service in the latter stages of dysentery, raised similar objections to its employment at the beginning; and Cullen went so far as to declare that it is one of the most improper purgatives that can be used in this affection.**

After this rhubarb was long neglected,†† but of late years it has been again brought into use in dysentery. It is praised by Barrallier and Heubner,‡‡ but I am inclined to agree with Savignac in adopting the practice of Zimmermann and reserving it for the later stages of the disease,§§ when perhaps the astringent effect which follows its cathartic

* The doctrines sketched in the text were more or less fully expressed by each of the following writers: ALTOMARUS—*loc. cit.*, p. 680, *supra*—and NICOLAUS PISO—*loc. cit.*, p. 684, *supra*—the first preferred rhubarb torrefied, the second unterrefied. HOLLERIUS—*loc. cit.*, p. 680, *supra*—affirmed that no medicine is more excellent for dysenteries than rhubarb. It may be used not only to purge once, but, if the symptoms require and the strength permit, may be repeated frequently. RONDELETIUS—*loc. cit.*, p. 680, *supra*—censured those who used torrefied rhubarb, which he says is rendered acrid by the empyreumatic matters generated by the heat. FORESTUS—*loc. cit.*, p. 680, *supra*—remarked that although certain illustrious physicians have objected to the use of rhubarb and myrobalans, they are not to be rejected because GALEN did not know them; for if he had he would undoubtedly have used them. He held that torrefied rhubarb should not be used at the beginning of dysentery, and that tamarinds are of doubtful value in that disease. FAB. HILDANUS—Cap. 8, p. 681, *op. cit.*, p. 644, *supra*—thought that torrefied rhubarb only should be used. FELIX PLATER—T. III, p. 809, *op. cit.*, p. 680, *supra*—cautioned against overtoasting the rhubarb. SEPTALIUS—*loc. cit.*, p. 680, *supra*—held, contrary to the general opinion, that moderate torrefaction rather increased than diminished the purgative properties of rhubarb. SENNERTUS—T. III, p. 132, *op. cit.*, p. 645, *supra*—advised that rhubarb should not be torrefied, and that purgation should be repeated until all the vicious humors are expelled: "Neque solum semel purgandum, sed aliquoties hoc faciendum, donec humor vitiosus maxima ex parte sublatus sit," p. 134. In Quæstio IV, "An purgantia exhibenda sint in dysenteria?" he criticises those who, like ALEXANDER MASSARIA and VALLESIUS, have too slavishly obeyed the caution of AVICENNA—see note *, last page—and altogether rejected the use of purgatives in dysentery. Compare also ZACUTUS LUSITANUS—*Praxis Hist.*, Lib. VII., No. VI, T. II, p. 635, *op. cit.*, p. 665, *supra*; RIVERIUS—p. 302, *op. cit.*, p. 680, *supra*; and ROLFINCIUS—p. 298, *op. cit.*, p. 681, *supra*. I may add that SYLVIUS—*Prax. Med.*, Lib. I Cap. XIII, § 56, p. 184, edition cited p. 690, *supra*—laid great stress on the use of toasted rhubarb combined with a grain of "laudanum opiatum." WILLIS—*loc. cit.*, p. 680, *supra*—declared that in the London dysentery of 1670 any evacuation, whether bloodletting, purging or vomiting, was always hurtful; but in the bloody flux of 1671 he gave a "purging yet strengthening" potion of rhubarb, myrobalans, &c., after having first, however, moderated the flux with mild astringents, "liquid laudanum," &c., p. 79. And SYDENHAM—Vol. I, p. 170, *op. cit.*, p. 407, *supra*—although he held that rhubarb alone was "not worth much in fluxes," always followed bloodletting with his "usual lenitive cathartic," composed of tamarinds, senna leaves, manna, rhubarb, &c.

† See, for example, HOFFMANN—T. III, p. 155, *op. cit.*, p. 681, *supra*; VAN SWIETEN—T. II, § 724, p. 391, *op. cit.*, p. 663, *supra*; and TISSOT—T. III, p. 9, *op. cit.*, p. 625, *supra*.

‡ DEGNER—Cap. 3, § 31 *et seq.*, p. 140 *et seq.*, *op. cit.*, p. 625, *supra*. He gave ROLFINCK'S tincture, consisting of half an ounce of rhubarb, a drachm of salt of tartar and five or six ounces of chicory water or mint water, p. 144. Of this he says: "Præterea divinum potius quam humanum remedium hanc Rhei Tincturam adpellare licebit," Cap. 5, § 15, p. 271.

§ For example, HILLARY—p. 209, *op. cit.*, p. 681, *supra*—after administering an emetic of ipecacuanha, gave "a dose of torrefied rhubarb mixed with an opiate, to procure the distressed patient some respite and ease, and abate the flux."

‖ PRINGLE—p. 262, *op. cit.*, p. 640, *supra*—after the emetic—see p. 693, *supra*—gave next morning five grains of calomel with twenty-five or thirty of rhubarb. He adds: "At first I gave the rhubarb without any calomel, and usually about half a drachm; but afterwards I found it necessary either to give double that quantity for a dose, or to join the calomel to thirty grains, in order to procure a thorough passage." He afterwards "generally endeavoured to finish the cure by combining purges with opiates," p. 268. MACBRIDE—p. 465, *op. cit.*, p. 664, *supra*—followed the same practice, but gave smaller doses: "A scruple or twenty-five grains of rhubarb, with two or three grains of calomel." GEACH—p. 21, *op. cit.*, p. 660, *supra*—followed the emetic by four grains of calomel and thirty of rhubarb.

¶ BAKER—p. 28, *op. cit.*, p. 437, *supra*. He also objected to calomel and rhubarb, p. 29. At a still earlier period BONTIUS—*De Med. Indorum*, Lib. III, Cap. 3, p. 65, *op. cit.*, p. 681, *supra*—reported that the common mode of treating dysentery in the Indies by an infusion of rhubarb in a decoction of tamarinds was an uncertain method, which often caused the destruction of the patient. He thought that restoratives were required rather than purging.

** ZIMMERMANN—Cap. VI, S. 121, *op. cit.*, p. 648, *supra*; yet he sometimes gave rhubarb, combined with his favorite cream of tartar, to peasants, Cap. V, S. 84. For his praise of its use in the latter stages of the disease, see S. 106: "Am Ende der Krankheit diente mir die Rhabarber ungemein." CULLEN—*First Lines*, § 1080, Vol. II, p. 324, *op. cit.*, p. 648, *supra*.

†† Among those who have condemned the use of rhubarb I may mention FOUBNIER et VAIDY—pp. 378 and 395, *op. cit.*, p. 362, *supra*; HAUFF—S. 403, *op. cit.*, p. 534, *supra*; and NAUMANN—Bd. IV, Abth. 2, S. 83, *op. cit.*, p. 645, *supra*.

‡‡ BARRALLIER—p. 777, *op. cit.*, p. 603, *supra*—enumerates calomel, rhubarb, manna, whey, tamarinds, cream of tartar and the neutral salts as the best purgatives in dysentery. HEUBNER—S. 545, *op. cit.*, p. 529, *supra*—is equally eclectic. He prefers castor oil, indeed, but thinks the effects of tamarinds, rhubarb, ipecac. in small doses, calomel, or the tartrates and sulphates quite the same; with these to choose from it is easy to prepare a dose to the taste of the patient.

§§ SAVIGNAC—p. 364, *op. cit.*, p. 620, *supra*.

action may prove serviceable. It is true that the recent experiments of Rutherford and Vignal indicate that it possesses the power of stimulating the hepatic secretion,* but the same power is enjoyed to a still higher degree by several saline cathartics which are more certain in their action and less likely to gripe or to irritate the inflamed mucous membrane. In catarrhal diarrhœas and in the chronic fluxes it has probably a greater range of usefulness; but the great variability in the quality of the drug, as actually found in the American market, constitutes a serious objection to its employment.†

During the seventeenth century attention was directed to the medicinal value of two neutral salts which subsequently enjoyed considerable popularity in the treatment of dysentery. The first was the *sulphate of soda*, which Glauber obtained by the action of oil of vitriol on common salt, and named *sal mirabilis*.‡ The second was *sulphate of magnesia*, the *sal catharticus amarus* of Nehemiah Grew, who prepared it by evaporating the water of the famous medicinal springs at Epsom.§ The sal catharticus was employed in dysentery by Cleghorn, and lauded above all other purgatives for this purpose by Baker and Donald Monro.‖ Cullen commended Glauber's salt, while Hunter, Wade and Christie used either indifferently.¶ Both Cleghorn and Pringle attached great importance to the evacu-

* RUTHERFORD and VIGNAL—Vol. X, p. 273, *op. cit.*, p. 701, *supra*.

† Consult on this subject E. R. SQUIBB—*Note on rhubarb*, Proc. of the Amer. Pharm. Ass., 16th annual meeting, 1868, p. 452; *Note on rhubarb. For* 1869, same Proc., 17th annual meeting, 1869, p. 398; and *Note on rhubarb*, same Proc., 18th annual meeting, for 1870, p. 180. From these papers it is quite clear that good rhubarb can be had by those who are willing to pay for it, if they know of whom to buy. It is also clear that the market is flooded with inferior grades.

‡ J. RUDOLPH GLAUBER, a celebrated chemist, who lived at Amsterdam, where he was born about the beginning of the seventeenth century, prepared this salt by lixiviating and recrystalizing the fixed salt remaining at the bottom of the retort after the preparation of his newly discovered spirit of sea salt. The supposed virtues of the sal mirabilis, both when administered internally and as an external application to wounds and ulcers, are described at length in his *Tractatus de natura salium*, (1658, in German;) I cite the Latin version, Amsterdam, 1659, p. 61 *et seq.*, where the method of preparation is not distinctly given, and it is alleged that it can also be made out of saltpetre and other salts, showing that other sulphates were confounded by him with the soda salt. See, for his process in detail, H. BOERHAAVE—*Elementa Chemiæ*, (1724;) I cite the English translation, London, 1741, Vol. II, p. 260—who also states that GLAUBER sometimes melted with his salt a small quantity of antimony, a practice which seems to be the germ of the mixture of tartar emetic with this and Epsom salt, used by Sir GILBERT BLANE and others: see note §, p. 691, *supra*.

§ NEHEMIAH GREW—*Tractatus de salis catharctici amari in aquis Ebeshamensibus et hujusmodi aliis contenti natura et usu*, London, 1695; I have not been able to see this work, and cite from MANGETUS—*Bibl. Script. Med.*, Geneva, 1731, T. I, Pars 2, p. 521—who has given an abstract of its contents. How rival establishments were set up, first at the springs on one side of Shooters-Hill in Kent, about the year 1700, and subsequently at other places, and how an imitation Epsom salt was afterwards manufactured from Bittern at the salt works, is related by Mr. JOHN BROWN, chymist—Philosophical Transactions abridged, Vol. VII, London, 1734, p. 729. The sulphate of magnesia is now manufactured on a large scale from dolomite. Perhaps even earlier than by the springs at Epsom, great renown, on account of their efficacy in dysentery, was acquired by the two springs Bagnuolo and Tettuccio at Mount Cutini in Tuscany, which, according to CONSTANTIN JAMES—*Guide Pratique aux Eaux Minérales Françaises et Étrangères*, 5me Éd., Paris, 1861, p. 364—contain chiefly chloride of sodium associated with smaller quantities of sulphates, carbonates, &c. These are the springs so extravagantly praised for their efficacy in dysentery by GABRIEL FALLOPPIUS—*De Thermalibus Aquis*, (1564,) Cap. 28, Opera, Venice, 1606, T. I, p. 326; and ANDREAS BACCIUS—*De Thermis*, Venice, 1588, Lib. III, p. 134, and Lib. V, p. 277. Want of space prevents me from discussing various other salines introduced by the iatro-chemical school. They were for the most part condemned by HOFFMANN—T. III, p. 157, *op. cit.*, p. 681, *supra:* "Summo quoque studio fugienda sunt illa remedia quæ intestina magis stimulant; veluti sunt cuncta salia, neutra ac digestiva, tartarus vitriolatus, arcanum duplicatum, salia thermarum, &c. Nihilo minus nitrum, nec non sal prunellæ, quod præsertim Riverius magnis extollit laudibus, ob vim refrigerantem atque temperantem quandoque commendari, et absorbentibus immisceri meretur pulveribus, utique, si æstus cum siti nimium urgeant, et subjecta cholericæ, biliosæque sint constitutionis." DEGNER—Cap. V, § 19, p. 276, *op. cit.*, p. 625, *supra*—made no such exception, remarking: "Sales omnes ex. gr. Tartar. vitriol. Arcan. duplic. Sal polychrest. Sal prunel. &c. contra omnem sane rationem ac prudentiam medicam ab aliis totics præscripti, mordaces sunt, et in intestinis exulceratis nil nisi graviores dolores et stimulos excitant, quare ne Nitrosa quidem, imprimis in statu et progressu morbi, tuta erant; fluxum enim magis exacerbasse observavi."

‖ CLEGHORN—Cap. V, p. 252, *op. cit.*, p. 637, *supra*—advised purgatives of the mildest kind, "such as whey, weak broth, sweet oil, solution of manna, cremor tartari, &c.;" but if these did not succeed, he gave six or seven grains of calomel with a grain of opium at night, and the next day "a purging apozem made of senna, manna, and sal catharticum." BAKER—*loc. cit.*, last page—recommends that mild cathartics, such as infusion of senna, manna and tamarinds be tried first; but if neither natural fæces nor scybala are brought away, more active purgatives should be tried, "ante omnia, ad salem catharticum amarum (quo nihil fere quidpiam aut certius aut citius alvo moranti calear addit) protinus transeundum." DONALD MONRO—p. 70, *op. cit.*, p. 625, *supra*—after repeated trials, found that rhubarb did not answer so well in the first stage of dysentery as "the sal cathartieum amarum, with manna and oil." He adds that Mr. FRANCIS RUSSEL, in the year 1756, when dysentery was very fatal at Gibraltar, found nothing to "contribute more to the cure, than repeated doses of these salts."

¶ CULLEN—*loc. cit.*, last page—recommended "a dose of Glauber's salts, ʒss. twice a day, or cremor tartari employed in the same manner." If this did not suffice to bring on evacuations by stool without pain and griping, he resorted to "tartar emetic, given in small doses and at such intervals as may determine their operation to be chiefly by stool." J. HUNTER—p. 239, *op. cit.*, p. 637, *supra*—says that in his experience with purgatives, "the bitter purging salt, or Glauber's salt," was found the best. J. P. WADE—*Select evidences of a successful method of treating fever and dysentery in Bengal*, London, 1791—used in dysentery a solution of an ounce or an ounce and a half of "either Glauber or bitter salts, to twenty ounces of water," sometimes with the addition of cream of tartar, manna, sugar or peppermint; one or two grains of tartar emetic were often added. This solution was given in doses of about two ounces every hour till it operated very freely by stool. He reports 45 cases in detail. J. CHRISTIE—*On the nature and causes of dysentery*, The Med. and Phys. Jour., Vol. I, 1799, p. 465—gave an ounce or an ounce and a half of GLAUBER'S salt, or of sulphate of magnesia, with or without a little manna, as the first dose. If the gripings continued, he gave a second dose of six drachms to an ounce of the same salt. If the disease was not checked, he pursued the treatment, as CULLEN did, by administering small doses of tartar emetic so as to act on the bowels.

ation of scybala, and regarded this as a prominent indication for the administration of cathartics in dysentery.* Cullen taught that the formation of scybala resulted from a preternatural spasmodic constriction of the colon, and insisted upon cathartics as the best means of relaxing this spasm.† These views, which were by no means brought into conflict with the older opinions as to the evacuation of bile and other morbid humors, gave additional prominence to the employment of cathartics in dysentery, and the neutral sulphates enjoyed their full share of popularity. Some used purgative doses of either salt alone, or combined with manna or senna; others employed the combination of salts and tartar emetic, as advised by Sir Gilbert Blane,‡ while Heberden recommended the administration of sulphate of magnesia in drachm doses, repeated every six hours, and claimed that it relieved the pain even before it operated as a purge.§

It is unnecessary to discuss all the other saline purgatives that found occasional employment in dysentery during the seventeenth and eighteenth centuries. It will be sufficient to refer to *cream of tartar*, long before occasionally prescribed, but first brought into prominence by the laudations of Zimmermann;‖ and *Rochelle salt*, commended for use in diarrhœa and dysentery by its inventor, Seignette, which, however, failed to obtain much favor for this purpose until more modern times.¶

The great popularity acquired by calomel as a cathartic in dysentery during the early part of the present century, and the discredit into which purgation subsequently fell, caused the use of the saline purgatives to fall into comparative neglect. Nevertheless they have not remained without advocates, especially in France, where the influence of Bretonneau and Trousseau was exerted in their favor.** At the beginning of our civil war the use of purgative doses of Epsom salt combined with a little tartar emetic was advised by Tripler, while Stillé commended small laxative doses of Epsom or Rochelle salt in inflammatory dysentery.†† Both these methods were extensively used for a while by our surgeons in the field; but Tripler's plan was soon pretty generally modified by omitting the tartar

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* See note †, p. 353, *supra*. † *Loc. cit.*, p. 705, *supra*. ‡ See note §, p. 691, *supra*.

§ WM. HEBERDEN—*Comm. de morb. hist. et cur.*, (1802.) Ed. altera, London, 1807, p. 134.

‖ Cream of tartar is mentioned among the mild laxatives suitable for use in dysentery by CLEGHORN—*loc. cit.*, note ‖, last page. ZIMMERMANN—Cap. 5, S. 82, *op. cit.*, p. 648, *supra*—followed his emetic of ipecacuanha—see p. 693, *supra*—by a drink composed of two ounces of barley and an ounce of cream of tartar, boiled in two pints and a half of water till the barley bursts, and then strained through a linen cloth. On the second day, in the morning, he gave three ounces of tamarinds boiled in half a pint of water and strained. During the night following he repeated the barley water with the cream of tartar. On the third or fourth day he repeated the tamarind decoction, continuing the barley water and cream of tartar in the mean time. Sometimes he gave an ounce or an ounce and a half of Sedlitz salt (sulphate of magnesia) instead of the tamarinds. CULLEN—*loc. cit.*, last page—sometimes gave cream of tartar in the same way that he did Glauber's salt. It was employed by SELLE—*Med. Clinica*, 7te aufl., Vienna, 1797, S. 145—and found efficacious even in serious cases by CHEYNE—p. 48, *op. cit.*, p. 686, *supra*.

¶ PETER SEIGNETTE, an apothecary at Rochelle—see J. BECKMANN's *History of Inventions and Discoveries*, English Transl., 2d Ed., London, 1814, Vol. IV, p. 616—published an account of this salt as an arcanum in the year 1672; this I have not been able to find, but according to G. L. ENCKELMANN—*Diss. de sale alkali de Seignette ejusque natura et usu*, Strasburg, 1756, p. 22—he commended it in the treatment of diarrhœa and dysentery, against which ENCKELMANN protests, unless indeed the diarrhœa takes its origin in mucus, or some other tenacious material obstructing the intestines. SEIGNETTE called his arcanum *sal alkali*; it was also known as the *sal polychrestus Seignette*, or *soluble sal polychrestus*. Its composition was made known in 1731 by BOULDUC—Mém. de l'Acad. des Sci., année 1731: see *Collection Academique*, T. VII, Paris, 1784, p. 281—and GEOFFROY—Phil. Trans., abridged, Vol. IX, 1747, p. 393.

** TROUSSEAU et PARMENTIER—T. XIV, p. 33 *et seq*, *op. cit.*, p. 439, *supra*—report several cases successfully treated by BRETONNEAU in the hospital at Tours during the epidemic of 1826 by repeated doses of Epsom salt. TROUSSEAU himself—T. III, p. 167, *op. cit.*, p. 664, *supra*—continued to employ this plan, and used it with success in various epidemics. He reports that it was also successfully employed during the epidemic which prevailed in 1842 in the garrison at Versailles, and that, in preparing the report on epidemics in France for the Academy of Medicine, he found that almost all the physicians, whose reports he examined, employed as their principal means of combating dysentery "purgatives, above all the neutral salts, such as sulphate of soda, sulphate of magnesia and Rochelle salt, (le sel de Seignette.)" Compare TROUSSEAU—*Rapport sur les épidémies qui ont régné en France en* 1856, Mém. de l'Acad. Imp. de Méd., T. XXII, 1858, p. LXXXVIII; also the *Rapport*, &c., for 1857, same Mém., T. XXIII, 1859, p. XLV. See also BARRALLIER—*Note sur une épidémie de dysenterie, observée a l'hopital de la marine de Toulon pendant l'année* 1859, L'Union Méd., N. S., T. X, 1861, p. 504—who gave the preference to Rochelle salt, of which in mild cases of dysentery he administered 15 grammes twice a day until the blood disappeared from the stools and they regained the diarrhœic characters.

†† C. S. TRIPLER—*loc. cit.*, p. 691, *supra*. STILLÉ—p. 334, *op. cit.*, p. 650, *supra*—says: "Epsom salts, or, still better, Rochelle salts, in the proportion of one ounce of either to a quart of water, of which a wineglassful is given every two hours, will generally in the course of a few hours diminish or even suspend entirely the tenesmus and produce a free discharge of bilious and watery stools. After this treatment has been pursued for eighteen or twenty-four hours, it should be suspended for an equal space of time, and meanwhile doses of three or five grains of Dover's powder repeated at intervals of three hours, after which the saline may be resumed as at first. Two or three such courses are generally sufficient," &c.

emetic, and the Epsom salt was given alone, or combined with other purgatives, especially senna and rhubarb, or used to follow a purgative dose of blue mass or calomel. Each of these plans had its advocates, but those who gave the salt uncombined were probably in the majority.* Rochelle salt was used to but a moderate extent during the war, and sulphate of soda was not supplied by the Purveying Department of the Army.†

This neglect of sulphate of soda, which at that time was popularly regarded in the United States as fit for horses rather than men, is certainly to be regretted. Not merely is the old renown of this salt sustained by the recently published clinical observations of Méry,‡ but the experiments of Rutherford and Vignal furnish reasonable grounds for preferring it to the sulphate of magnesia in the treatment of dysentery. These experiments show pretty conclusively that sulphate of soda produces a decided increase in the hepatic secretion, while sulphate of magnesia does not. The same experimenters found that a similar increase in the hepatic secretion was produced by sulphate of potassa, phosphate of soda and Rochelle salt;§ a circumstance which seems to justify the preference expressed by Savignac, on the grounds of clinical observation, for the phosphate of soda and Rochelle salt as purgatives in dysentery rather than sulphate of magnesia.‖ My own personal experience, so far as it goes, strongly inclines me to favor the sulphate of soda; but I suppose the other salines just named might be substituted with equal advantage, and that the Epsom salt is the least desirable of the saline purgatives for the treatment of dysentery.

Another cathartic that has enjoyed a great reputation in the management of this disease is *castor oil*. Well known to the Greek physicians,¶ who do not, however, appear to have

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* TRIPLER's method is lauded in Section H by WOODWARD—p. 51, *supra*—and SCHEETZ—p. 80, *supra*. R. R. MCMEENS, surgeon 3d Ohio vols.—*Letter from Meridith hospital, Nashville*, The Cincinnati Lancet and Observer, Vol. V, N. S., 1862, p. 351—reports that it was the favorite remedy with him. Saline purgatives, or small doses of the salines, for the most part Epsom salt, but in some instances Rochelle salt, are spoken of with approval in Section H by STORROW—p. 43, *supra*; SCHÜSSLER—p. 44, *supra*; EZRA READ—pp. 66 and 100, *supra*; VOLLUM and LEE—p. 71, *supra*; MCDONALD—p. 78, *supra*; HOYT—p. 80, *supra*; HARRISON—p. 82, *supra*; POTTER and BIGELOW—p. 83, *supra*; REYNOLDS—p. 84, *supra*; MCCLURE—p. 85, *supra*; GRANGER, PECK and GRIMES—p. 86, *supra*; MILLER—p. 89, *supra*; FOOTE and MCMILLEN—p. 90, *supra*; PYLE and BLADES—p. 91, *supra*; COOK—p. 93, *supra*; HUNT, p. 94, *supra*; and BIDWELL—p. 96, *supra*. Combined with or following a mercurial cathartic they are commended by JEWETT—p. 79, *supra*; MERRITT—p. 80, *supra*; and SANBORN—p. 94, *supra*. See also the testimony in favor of sulphate of magnesia as a laxative or purgative, of WM. HENRY THAYER—*An inquiry into the therapeutic value of sulphate of magnesia, oil of turpentine, and calomel in inflammation of the intestinal mucous membrane, especially in dysentery*, The Berkshire Med. Jour., Vol. I, 1861, p. 342; Surgeon P. C. PEASE, 6th N. Y. vols.—*Health of Wilson's Zouaves*, The Amer. Med. Times, Vol. III, 1861, p. 159; T. H. WALKER—*Camp diarrhœa*, The Chicago Med. Jour., Vol. XIX, 1862, p. 478; A. A. Surg. HENRY M. LYMAN—*Remarks on the prevailing diseases in the hospitals at Nashville, Tennessee*, The Amer. Med. Times, Vol. VI, 1863, p. 16; Asst. Surg. JEHU LITTLE, 24th Mo. vols.—*Camp dysentery*, The Chicago Med. Jour., Vol. XX, 1863, p. 505; and J. R. BLACK—*Camp diarrhœa*, The Cincinnati Lancet and Observer, Vol. VII, 1864, p. 262.

† Although of course these purgatives were used for many other purposes than the treatment of dysentery, yet some notion of their comparative popularity may be gathered from the statement of Surgeon W. C. SPENCER, U. S. A., according to which the quantity of sulphate of magnesia purchased during the civil war was 515,828 pounds; of Rochelle salt, 49,909 pounds. From the same statement I abstract the following quantities of other cathartics purchased during the war: Aloes, in powder, 5,916 lbs.; rhubarb, in lump, 3,476 lbs.; rhubarb, in powder, 8,284 lbs.; fluid extract of rhubarb, 16,125 lbs.; magnesia, calcined, 10,512 lbs.; podophyllin, 523 lbs.; castor oil, 220,354 quarts; calomel, 10,376 lbs.; jalap, in powder, 1,775 lbs.; compound cathartic pills, (of the U. S. Pharmacopœia,) 683,131 dozen.

‡ F. C. MÉRY—*De la dysenterie des pays chauds et de son traitement spécialement par le sulfate de soude*, Paris Thesis, No. 257, 1875. These observations were made on a French naval vessel, the Venus, stationed for eleven months on the western coast of Mexico during the French occupation, subsequently on the Calvados during a voyage around the world, and in the hospital ship Finistère carrying sick from Cayenne, Martinique and Guadeloupe back to France. The author claims to have obtained great success in the acute cases, and even in the chronic cases, in which tonics were the principal part of the treatment; the sulphate of soda always improved the character of the stools and relieved the anal and vesical tenesmus. He gave the first day 15 to 20 grammes of sulphate of soda dissolved in 80 to 150 grammes of water, divided into four doses. Afterwards the daily quantity was gradually diminished to as little as 4 or even 2 grammes daily, given in divided doses. He found it moderated the fever, diminished the number of the stools, and favorably modified their nature: they became at first sero-bilious, then feculent. The anal and vesical tenesmus were promptly relieved, and the tormina usually ceased after the first dose.

§ RUTHERFORD and VIGNAL—Vol. XI, p. 623, *op. cit.*, p. 701, *supra*—obtained the effects stated in the text by purgative doses of the salt injected into the duodenum of dogs. The purgative action of sulphate of magnesia was accompanied by an actual diminution of the secretion of bile.

‖ SAVIGNAC—p. 362, *op. cit.*, p. 630, *supra*—says that sulphate of soda and sulphate of magnesia have been praised by many physicians, but that he prefers to them the phosphate of soda, the tartrate of soda, or the tartrate of soda and potassa. His reason is that the action of these salts is more gentle, although they are equally efficient as purgatives.

¶ DIOSCORIDES—Lib. IV, Cap. 164, fol. 215, *op. cit.*, p. 623, *supra*—described the castor-oil plant under the name of κίκι or κρότων, and says that its seeds purge phlegm, bile and water from the bowels, and excite vomiting. Its oil is unfit for food, but useful for external applications; he speaks of it as κικινον ἔλαιον. In Lib. I, Cap. 38, fol. 19, *op. cit.*, he describes the then used process of manufacturing it, and enumerates various external disorders in which it is useful, such as psora, ulcers of the head, &c. According to GALEN—*De Simp. Med. Temp. ac Fac.*, Lib. VII, Cap. X, § 24, [Ed. Kühn XII. 26.]—the oil made from the seeds of this plant is of a warm temperament, and may be substituted for the oil of radish—*De Succedaneis Lib.*, [*id.*, XIX, 741.] "Pro rhaphanino oleo, ricininum oleum." Elsewhere—*Comm. VI, Sect. VI, in Hippoc. Epidem.* VI. § 5, [*id.*, XVII. B, 327,]—in speaking of the usefulness of certain oils in relieving pain when externally applied, he classes castor oil with the oils of laurel, cedar, mustard and radish.

used it in the treatment of the fluxes; it seems to have been entirely forgotten, when attention was again directed to it in 1764, by the dissertation of Peter Canvane.* The reputation it speedily acquired as a mild but efficient cathartic soon led to its employment in dysentery, especially by the English physicians. John Clark, though he recognized that it was unfit for use when rancid, and plainly indicates by the language of his very laudation that the stomachs of his patients sometimes rebelled against it, praised it as one of the very best purges in this disease.† Johnson regarded it as almost the only purgative that is proper in dysentery, but found it sometimes necessary to increase its activity by adding a few grains of calomel.‡ An equally favorable opinion was entertained by Bampfield, who, recognizing undecomposed oil in the stools, imagined that it did good by smearing the mucous surface and thus protecting it from irritation by the morbid secretions.§ Both Baly and Copland gave castor oil the preference over other purgatives in dysentery.‖

It is true that Cheyne observed that it often aggravated the tormina and tenesmus, but he did not on that account abandon it; he advised instead that it should be combined with laudanum or oil of turpentine. For the same reason the combination with laudanum was employed by Bankier,¶ who objected to the admixture of oil of turpentine as too stimulating and as apt to nauseate. Such objections did not, however, interfere with the general popularity of castor oil among English physicians. Alone, or in some one of the combinations mentioned, it was extensively used. It soon found many admirers on the continent also, where its employment in dysentery has been praised by Bamberger, Vogt, Savignac, Niemeyer and Heubner.** In the United States this use of castor oil, which had been strongly recommended by George B. Wood, and approved in the tract of Stillé, at least for mild dysenteries,†† was brought into pretty extensive service during the civil war.‡‡ Indeed, castor oil was very frequently resorted to by our military surgeons whenever a cathartic was desired for any purpose, as is shown by the circumstance that nearly a quarter of a million quarts were purchased by the Purveying Department of the Army during the

* PETER CANVANE—*Diss. on the oleum palmæ christi*, &c., 1764; I have not been able to see a copy of this essay, which is cited in the *Pharmacographia*—p. 511, *op. cit.*, p. 704, *supra*.

† JOHN CLARK—*Obs. on the Diseases which prevail in Long Voyages to Hot Countries*, &c., (1773,) 3d Ed., London, 1809, p. 221: "Castor oil, when properly prepared, and not grown rancid by keeping, I have found to be one of the best purges in the dysentery. It seems to be possessed of an anodyne quality, frequently easing the painful gripes as soon as taken, and seldom fails, when it agrees with the stomach, to procure copious evacuations." Among the earlier writers who mention castor oil as a suitable purgative in dysentery I may mention J. HUNTER—p. 239, *op. cit.*, p. 637, *supra*.

‡ JAMES JOHNSON—p. 234, *op. cit.*, p. 682, *supra*.

§ R. W. BAMPFIELD—p. 124, *op. cit.*, p. 682, *supra*: "The oleum ricini is perhaps better calculated to afford relief in dysentery, than any other aperient or cathartic; for its action is not only mild and generally effectual, but I have observed, that some of it passes undecomposed, in its oily form, through the intestines, and appears on the surface of the excrement, and, hence, may serve as a sort of sheather or defence to the diseased intestines, from the stimulus of fæces and morbid secretions."

‖ BALY—p. 535, *op. cit.*, p. 535, *supra*; COPLAND—Vol. I, p. 718, *op. cit.*, p. 682, *supra*.

¶ CHEYNE—p. 50, *op. cit.*, p. 686, *supra*—remarks that the combination with oil of turpentine was "borrowed from puerperal practice, and much used in Dublin;" that it rendered the operation of the oil milder and more certain, and that it "sometimes effectually reduced that tumefaction of the belly which often so much distressed the patient." BANKIER—p. 148 *et seq.*, *op. cit.*, p. 637, *supra*.

** BAMBERGER—S. 415, *op. cit.*, p. 578, *supra*—describes it as "das milder aber eben so sicher wirkende Oleum Ricini." VOGT—S. 178, *op. cit.*, p. 645, *supra*—enumerates it among the bland purgatives suitable for dysentery. SAVIGNAC—p. 363, *op. cit.*, p. 620, *supra*—remarks: "C'est le purgatif que j'emploie le plus volontiers dans la dysentérie." He adds that a small dose purges as well as a large one, which is therefore "complétement inutile" he gives 10 to 12 grammes in broth or in an emulsion of almonds. NIEMEYER—Bd. II, S. 755, *op. cit.*, p. 645, *supra*—gave in the milder grades of dysentery a mild laxative, "am besten aus Ricinusöl oder Tamarindendecoct." HEUBNER—S. 545, *op. cit.*, p. 529, *supra*—observes: "Vor Allem ist hier das mild und sicher wirkende Ricinusöl hervorzuheben, dem in neuerer Zeit der Vorzug gegeben wird."

†† G. B. WOOD—Vol. I, p. 720, *op. cit.*, p. 671, *supra*—commended calomel as the cathartic par excellence in dysentery, but "as it is not quick in its operation" it should be "assisted by other medicines." * * * "Of these, castor oil is on the whole probably the best. Should it offend the stomach in its ordinary form, it may be administered in emulsion with gum arabic, sugar, and some aromatic water. In the advanced stages of dysentery, this oleaginous mixture may often be advantageously combined with a little laudanum, and given in small divided doses at short intervals. Thus administered, it often produces a soothing effect on the bowels, while it operates as a laxative." STILLÉ—*loc. cit.*, p. 707, *supra*.

‡‡ In Section II it is spoken of with favor by SCHÜSSLER—p. 44, *supra*; COUES—p. 64, *supra*; WAINWRIGHT—p. 78, *supra*; FORBES—p. 82, *supra*; PECK—p. 86, *supra*; BEACH—p. 89, *supra*; MORSE—p. 92, *supra*; HUNT—p. 94, *supra*; and BRADT—p. 100, *supra*. Some of these gentlemen combined it with laudanum, but most of them with oil of turpentine. See also, in favor of its use, the papers of P. C. PEASE—*op. cit.*, last page; J. F. HAMMOND—*op. cit.*, p. 687, *supra*—who used it after giving a scruple of calomel; W. KEMPSTER—*op. cit.*, p. 493, *supra*—who administered it with laudanum and ginger in diarrhœa from irritating food; JEHU LITTLE—*op. cit.*, last page; and especially A. A. Surgeon HENRY M. LYMAN—*On the value of local treatment in chronic diarrhœa and dysentery*, The Amer. Med. Times, Vol. VIII, 1864, p. 149.

four years of the struggle.* Yet in England, where it first found favor, it seems to be losing credit in this disease. Aitken† does not appear to regard it as worthy of mention in this connection, and Maclean only refers to it incidentally as useful in some cases of mild dysentery.‡

Notwithstanding the array of testimony in its favor, I cannot say that the use of castor oil as a purgative in dysentery commends itself to my judgment. Not only is it objectionable on account of the extreme repugnance with which it is swallowed by the great majority of patients, its tendency to produce unpleasant gripings, which is so well known that the admixture of laudanum is usually resorted to as a matter of course, and the readiness with which it becomes rancid when kept on hand; but I am by no means satisfied by the evidence brought forward that it approaches other less objectionable cathartics in the efficacy of its action in this disease. Some of the most observant practitioners who have employed it report that it often fails to relieve the symptoms, or actually appears to aggravate them.§ The experiments of Rutherford and Vignal show quite positively that it exercises no stimulating action on the hepatic secretion,‖ and it therefore fails to meet one of the most important indications in the early stages of dysentery. Of course it is not to be denied that its purgative action may be followed by benefit in conditions for which purgatives are appropriate; but better results may be obtained by other means. It seems strange to find the use of this nauseous oil in dysentery commended by some of those who have most urgently protested against the administration of even the blandest fats as food in this disease.¶ For myself, I have long since abandoned it, and counsel others to do the same.**

*Calomel*, which, during the early part of the present century, played so prominent a part in the treatment of dysentery, appears to have been first used for that purpose by Andreas Libavius about the commencement of the seventeenth century.†† Robert Boyle, having successfully treated an obstinate case of dysentery by calomel and rhubarb, communicated his treatment to a certain ancient army surgeon, who replied that calomel had been his own great arcanum in that disease, and that he had cured hundreds of soldiers with it.‡‡ Degner relates that during the reign of the pathologia animata calomel was

* See note †, p. 708, *supra*. † AITKEN—*op. cit.*, p. 647, *supra*.

‡ MACLEAN—Vol. I, p. 119, *op. cit.*, p. 657, *supra*: "In some cases it may be necessary to give a few drachms of fresh castor oil, guarded by a few minims of tincture of opium, or a few drops of chloroform."

§ For example, AUSTIN FLINT—*Clinical report on dysentery*, Buffalo Med. Jour., Vol. IX, 1853-4, p. 199—gave it in eight cases of dysentery. In two the disease appeared to be aggravated; in three no obvious change for the better or worse was observed; only in three was the apparent effect good, as indicated by the improvement in the character of the discharges.

‖ RUTHERFORD and VIGNAL—Vol. X, p. 293, *op. cit.*, p. 701, *supra*. ¶ See note ‡, p. 668, *supra*.

** In so doing I have not overlooked any of the recent utterances in its favor. See, for example, H. C. WOOD—p. 433, *op. cit.*, p. 675, *supra*: "In various inflammatory or irritative affections of the alimentary canal, castor oil is of the greatest service, partly, no doubt, by removing acrid irritating secretions or foreign materials, such as undigested food, and partly by causing a depletion of the congested vessels, but also apparently by virtue of an almost specific power, which renders it the most satisfactory cathartic in these cases. This is especially seen in the acute diarrhœas and even in the chronic enteritis of children, but also holds good in the diarrhœas and dysenteries of adults."

†† This statement is made by C. OTTO, to whose elaborate dissertation—*De actione hydrargyri medica*, Part. I et II, Copenhagen, 1819—I refer the reader for the history of the mercurials generally, and of their use in various diseases prior to the date of this work. He remarks: "Usus mercurii in dysenteria admodum antiquus est, jam a Libavio commendatus, postea maxime a medicis Anglicis laudatus," Part. II, p. 174; and cites J. HORNUNGUS—*Cista Medica*, Nuremburg, 1625. This work I have not been able to see; according to MANGETUS—*Bibl. Script. Med.*, Geneva, 1731, T. I, Pars 2, p. 753, and T. II, Pars 1, p. 77—it contains a number of the medical epistles and concilia of LIBAVIUS, who died 1616.

‡‡ ROBERT BOYLE—*The advantages of the use of simple medicines*, 1686; I cite *Works*, London, 1772, Vol. V, p. 119—remarks: "I remember, I had an opportunity to observe the efficacy of *mercurius dulcis*, in a stubborn dysentery, that had baffled the remedies of an ancient physician. But though a reflection on the virtue I knew this medicine to have of allaying sharp humours, and resisting putrefaction, may justly increase my favourable opinion of it; yet not thinking my experience competent, I imparted it to an ancient and expert chirurgeon, that was the chief of those, that belonged to a famous and judicious general of an army; who thereupon frankly confessed to me, that this was his great arcanum, wherewith he had cured many scores, or rather hundreds of soldiers in this general's army: only, whereas my way is to give from 8, or 10, to 12, or at most 15 grains of *mercurius dulcis* for a dose, made up with some little rhubarb, &c., or other ingredient that would make it work once, twice, or thrice with another patient, (for the dysentery itself helps to carry off the medicine;) he, both to disguise it, and to make it more easily takeable, made it up with sugar and mucilage of gum-dragon into lozenges, whereof one might contain from near a scruple to half a drachm of the *mercurius dulcis*, of which he ordered the soldiers to take one at a time, without hindering their march, only bidding them have a great care, that nothing should stick between their teeth, or in their throats."

regarded as an infallible antidysenteric by many of the physicians who believed the disease to originate from minute vermiculi.* Hoffmann protested against its use on theoretical grounds which appear to have convinced Degner,† but did not interfere with the gradual spread of the use of calomel in dysentery during the eighteenth century. In the dysentery of Minorca, Cleghorn sometimes gave six or seven grains of it at night, followed by a saline cathartic next morning.‡ The combination of calomel and rhubarb was commended by Richard Mead for dysenteries rendered obstinate by a bad habit of body;§ and the same combination was employed as a purge in the early stages of ordinary dysenteries by Pringle, Macbride, Geach and Hunter.‖

This use of calomel as a cathartic is a very different matter from the employment of it or other preparations of mercury with a view to producing the constitutional impression of the drug as expressed by salivation; but the history of the two modes of administering mercurials is so intimately connected that it will be convenient to consider both in this place. When Bogue visited India in 1772, he found it a common practice on the Coromandel coast to treat bilious and chronic fluxes with mercurial inunctions, or small doses of mercury frequently repeated.¶ This plan was brought to the notice of the profession in England in 1787 by Lind, who explained its alleged success by the supposed antiphlogistic power of the drug;** Thomas Houlston had previously published an account of several cases of dysentery successfully treated by mercurial inunctions pushed to salivation.††

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* DEGNER—p. 236, note, *op. cit.*, p. 625, *supra*: "Mercurium dulcem jam ante multos annos plures medici tanquam non fallens medicamentum antidysentericum laudaverunt, dum putabant hunc morbum per vermium insecta excitari originemque ducere," &c.

† HOFFMANN—T. III, p. 157, *op. cit.*, p. 681, *supra*: "Unde non mirari satis possum, quosdam, et præsertim Boyleum de S. M. V. pag. 52. mercurium dulcem in dysenteria commendare: quippe qui ejus est indolis, ut ab admixtione salium aeriorum, quæ in nostro morbo larga præsto sunt quantitate, caustieus reddatur." DEGNER repeats this suggestion in the note just cited as an objection to the use of calomel in dysentery, and adds that it would be well to wait till the dysentery producing vermiculi are demonstrated before basing our therapeutics upon such a notion. I may add that BAKER—p. 29, *op. cit.*, p. 437, *supra*—expressed the opinion that it was better to give a larger quantity of rhubarb than to admix calomel as some recommend.

‡ CLEGHORN—p. 252, *op. cit.*, p. 637, *supra*—only administered it "when other means have failed:" he combined it with a grain of opium, and gave next morning the "purging apozem" described in note ‖, p. 706, *supra*.

§ RICHARD MEAD—*Monita et Præcepta Med.*, London, 1751; I cite the English translation published in London the same year: "Lastly I recommend as an useful remark, that this course is sometimes rendered ineffectual by a bad habit of body. In such cases, to the foregoing method it will be proper to add medicines, which correct the humors; and indeed some doses of rhubarb, with a small proportion of dulcified mercury sublimate, commonly called calomel, will prove very conducive to that end," p. 125.

‖ STILLÉ—*Therapeutics*, &c., 4th Ed., Philadelphia, 1874, Vol. II, p. 799—falls into a strange error with regard to PRINGLE, remarking: "The benefits of mercurials in this affection are said to have been first pointed out by Pringle, in 1768." The fact is, that not merely had others used this treatment for more than a century, but PRINGLE had already commended it in the 3d edition of his *Obs. on the Dis. of the Army*, London, 1761, p. 240, note, remarking: "By later experience I am convinced that rhubarb alone, in whatever dose, seldom operates so easily or so efficaciously, as when joined with well prepared calomel. My usual formula is that of the Pharmacop. Pauper. Edinburg, viz: ℞. Rhubarb. pulv. gr. xxv. mercur. dulc. sexies sublimat. gr. v. syr. simp. q. s. ut f. bol. mane sumend. But this medicine I never give in the very low state of the disease, when there is a putrid fever, or when I suspect the intestines to be much excoriated." In the 4th edition, London, 1764, p. 272, and in subsequent editions, this note is omitted, and a purge of "five grains of calomel, with five and twenty of rhubarb" strongly commended in the text. MACBRIDE—*loc. cit.*, p. 705, *supra*. GEACH—*loc. cit.*, p. 705, *supra*. J. HUNTER—*loc. cit.*, p. 709, *supra*.

¶ BOGUE, of Titchfield, communicated his observations to LIND, by whom they were published in his *Essay on Diseases incidental to Europeans in Hot Climates;* I cite 5th Ed., London, 1792, p. 99, note. This note was copied by CLARK—*vide* p. 712, *infra*—which has led EWART—p. 347, *op. cit.*, p. 681, *supra*—into error, for he attributes to him the observation of BOGUE. I may add that WILLIAM WRIGHT, in a letter dated December 10, 1791—*Med. Facts and Obs.*, Vol. VII, London, 1797, p. 24—claims to have given calomel freely (in doses of 5 grains every six hours) in dysentery as early as 1764.

** JAMES LIND—*An account of the efficacy of mercury in the cure of inflammatory diseases, and the dysentery*, (a letter dated Jan. 3, 1787) The London Med. Jour., Vol. VIII, 1787, p. 43—states that this practice was "made known to the different surgeons in the Carnatic by a letter sent to each of them from the late Mr. Paisly, first surgeon of the Presidency of Madras. Their method is as follows:—As soon as the patient begins to complain of symptoms of dysentery, they give him repeatedly small doses of emetic tartar till it operates upwards and downwards, and thoroughly cleans the stomach and bowels; after which they begin to give mercury combined with ipecacuanha in the following form: ℞. Argent. viv. ʒj. Pulv. gum arabic ʒij. Aq. puræ q. s. Tere in mortar. marmor. ad perfect. extinct. globulorum, et adde Pulv. rad. ipecacuan. ʒj. Fiat massa dividenda in pilulas clx., quarum capiat unam, tertia vel quarta quaque hora." LIND remarks: "It is probably from mercury preventing inflammation, and consequently mortification, that the above practice is successful;" and adds: "In the cure of inflammatory disorders by means of mercury, we ought carefully to guard against inducing any great degree of salivation, by which many dreadful symptoms are brought on."

†† THOMAS HOULSTON—*Obs. on Poisons; and the Use of Mercury in the Cure of Obstinate Dysenteries*, London, 1784; I cite the new Ed., Edinburgh, 1787, p. 63 *et seq.* The first of the cases is reported to have been thus treated in 1777. This method was also commended by WM. BOAG—*Obs. on the fevers and dysentery of hot climates; and on the use of mercury in those diseases*, Med. Facts and Observations, Vol. IV, London, 1793, p. 15—who states that when he wrote, Jan. 16, 1792, the usual method of treating those complaints in the general hospital at Bombay was "to rub two drachms of the strong mercurial ointment upon the belly, legs, and thighs of the patient, every night and morning, till it sensibly affects the mouth." The same plan was recommended by THOMAS THOMSON—*De la dysenterie, et des effets du mercure*, &c., Paris Thesis, No. 321, 1815, p. 10—who rubbed into the abdomen of the patient one or two drachms of mercurial ointment daily, and at the same time gave internally two grains of calomel, with half a grain or a grain of opium, two or three times a day until the mouth was affected; and as late as 1830 by CORNUEL—p. 136, *op. cit.*, p. 615, *supra*—who, however, only resorted to it in very severe cases of acute dysentery, because in slight or chronic cases he found it so apt to salivate.

Meanwhile Clark had employed repeated doses of calomel and opium in the epidemics of dysentery which occurred at New Castle and its vicinity from 1781 to 1785; until the last of these epidemics he was in doubt whether the apparent benefit was due to the purgative or the mercurial action of the medicine, but he then became convinced that the latter view was correct, and claimed that so soon as the gums became tender the gripes and tenesmus were relieved and the patient promptly recovered.*

The administration of calomel and opium with a view to salivation soon became a favorite mode of treating dysentery in India, if we may judge from the accounts of cases treated in the Calcutta General Hospital in 1796 and 1797, preserved by Charles Maclean and Alexander Grant. If four to ten grains of calomel combined with one to six of opium, and frequently repeated, did not salivate, free inunctions with mercurial ointment were employed to hasten the effect. The deplorable mortality that resulted did not disabuse the minds of the Indian practitioners of their blind confidence in the wisdom of the plan they had adopted.† We have the testimony of Johnson with regard to the employment of calomel in large doses pushed to salivation by various English naval surgeons during the first decennium of the present century. Among them, Cunningham, in 1805, gave it in scruple doses, repeated twice or thrice a day; one of his patients took in this way eighteen scruples: he claimed that of sixty patients thus treated none died. Johnson himself employed the same mode of treatment, but only in cases of emergency; in ordinary dysenteries he was content to give daily in divided doses from twenty-four to forty-eight grains of calomel with from two to four grains of opium and ten to fifteen of antimonial powder or ipecacuanha. His object in either case was the prompt production of salivation; for he held that nothing could be more useful, after the first stage of the disease had been treated by free venesection, than to saturate the system with mercury.‡ Salivation, indeed, appears to have been the object of most of the English physicians who gave calomel, whether in

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* JOHN CLARK—Part II, Chap. 3, Sect. 4, "*On the treatment of obstinate dysenteries by mercury*," p. 230 *et seq.*, *op. cit.*, p. 709, *supra*. Twelve illustrative cases are given, all selected from the epidemic of 1785. He cites the observations of BOGUE and the paper of LIND, but remarks: "Although mercury had not been proposed for the cure of the dysentery when I was last in India, yet it appears that, soon afterwards, its efficacy was confirmed in this disease. But, having had no correspondence with my acquaintances in that part of the world, this circumstance did not come to my knowledge till the year 1787," &c., p. 258. As to the mode in which he thought the remedy acted, see p. 232. He gave at the beginning of the disease, every night, 5 to 10 grains of calomel with enough opium "to procure an alleviation of the gripes;" after a few nights he diminished the quantity. To two patients he gave 3 grains of calomel conjoined with opium every four hours.

† CHARLES MACLEAN—*Practical Illustrations of the Progress of Medical Improvement for the last thirty years*, London, 1818. See cases 16, 17, 18, 20 and 22, p. 48 *et seq.*, all treated in the General Hospital, Calcutta, in 1796. A. GRANT—*op. cit.*, p. 691, *supra*—has preserved a dozen cases similarly treated in the same hospital in 1797. WALTER RALEIGH—*Obs. on Idiopathic Dysentery*, Calcutta, 1842, p. 61—examined some of the diaries of this hospital, "which the white ants had not entirely eaten up," and reports that during the years 1797, 1798 and 1799 he found the records of 238 cases of dysentery treated, of whom 127 died. He justly remarks: "Such frightful extent of mortality may doubtless in part be attributed to the inefficient or even baneful treatment pursued for the relief of the disease, at these early periods," p. 63.

‡ JAMES JOHNSON—p. 218 *et seq.*, *op. cit.*, p. 682, *supra*. He gives a tabular view of thirty cases treated by JOHN CUNNINGHAM, surgeon of H. M. S. Sceptre, (on board that ship,) in 1805. The average number of scruples of calomel taken by each man was seven and a half. CUNNINGHAM is cited as saying "that calomel, administered in scruple doses twice or thrice a day, is an almost certain remedy for dysentery—in hot climates at least," and that "in obstinate cases, the system must be well impregnated, before a permanent cure can be expected," p. 222. JOHNSON himself spoke of his ordinary method described in the text as giving "mercury, in comparatively small doses," p. 218, and further on remarks: "But whenever, in doubtful cases, I had occasion to push boldly on for ptyalism, I gave the calomel in scruple doses; which I found, by repeated experience, to sit easier than either a smaller or a larger quantity of that medicine—a curious, but a certain fact." See also p. 235. The American reader will be interested to learn from an article on the *Medical topography of New-Orleans; with an account of the principal diseases that affected the fleet and army on the late expedition against that city*—communicated by a Naval Surgeon, The Edinburgh Med. and Surg. Jour., Vol. XII, 1816, p. 136—that the English army, defeated by General Jackson, before New Orleans, January 8, 1815, had previously suffered greatly from dysentery, which was treated with calomel in scruple doses. The writer, whose patriotic hatred of the Americans is comically conspicuous in his account of the events of the expedition, was probably as formidable to the English army as any officer of equal rank on the American side, for he writes: "I have in this way given 16, 18, or 20 scruples of calomel in the course of half as many days, before the mouth became affected." Indeed so general did this plan of treatment become that CRAIGIE—Vol. I, p. 927, *op. cit.*, p. 268, *supra*—tells us that it was "emphatically named the scruple dose practice." STILLÉ—in the first edition of his *Therapeutics and Materia Medica*, Philadelphia, 1860, Vol. II, p. 833—makes the astonishing statement that "The treatment of dysentery by large and repeated doses of calomel appears to have originated with Annesley. (Diseases of India, p. 434 *et seq.*)" Now ANNESLEY himself, in the work cited, expressly states that he derived his plan of giving scruple doses of calomel from JOHNSON: see note ‡, next page. The same misstatement will be found in the 3d edition of STILLÉ'S work, Philadelphia, 1868, Vol. II, p. 716, but in the 4th edition, Philadelphia, 1874, Vol. II, pp. 799 to 801, "AINSLIE" is in several places substituted for "ANNESLEY;" an evident misprint. Indeed, I note that AINSLIE—*Materia Indica*, London, 1826, Vol. I, p. 649—so far from having invented the plan of giving large doses, which he attributes to ANNESLEY, CARTWRIGHT and others, preferred "repeated small doses, by which means I found the weapon more within my own control;" and again, on p. 553, declares that he "certainly would object to the very large doses now given equally in England and in India ever being introduced into general practice."

large doses or small, during the first quarter of the present century; they hoped in this way to obtain to the utmost the supposed antiphlogistic virtues of the drug.*

There were a few who, like Bampfield and Ballingall in India, and Cheyne in Dublin, sought to impose some limitations on these excesses.† With these undoubtedly should be ranked Annesley, who indeed gave calomel in scruple doses as a purge, and in smaller doses to act upon the liver, yet insisted that the production of ptyalism should not be made the object of the physician. But the plausible manner in which Annesley maintained the cholagogue and antiphlogistic virtues of calomel, and his bold assertion, that if ptyalism does occur it should be viewed as a satisfactory indication of the beneficial operation of the treatment, had probably more influence in encouraging the free use of this mercurial than his warnings exercised in the direction of restraint.‡ Certainly calomel in scruple doses, or calomel or other mercurials pushed to salivation, continued for some years to be freely employed in India, as may be seen by the testimony of Waddell, Bankier, R. H. Hunter, Green, Moffat and Raleigh.§

* Among those who used this practice I may name Sir JAMES MCGRIGOR—*Med. Sketches of the Expedition to Egypt from India*, London, 1804, p. 185: "Mercury is now the remedy relied on everywhere." Neutral salts may sometimes be substituted in acute cases, but "when the disease was of some weeks standing, and where a chronic disease occurred, calomel given in small doses proved the best and indeed the only useful remedy." Subsequently he came to restrict the applicability of mercury to cases in which there is some hepatic complication; and thought it advisable to "introduce it gradually and gently into the system," but he still held that "the cases are very numerous, where no other remedies gave the patient a chance of life," p. 431 *et seq.*, *op. cit.*, p. 612, *supra*. WILLIAM FERGUSON—*On the mercurial plan of treatment in dysentery*, (read Jan. 16, 1810,) Med.-Chir. Trans., Vol. II. 3d Ed., London, 1817, p. 181—advised that "half a grain of calomel, with one grain of ipecacuan," should be given every hour, "till the gums were affected. This generally took place in 48 hours, when a solution of the disease might be looked for with confidence," p. 184. CHISHOLM—p. 60, *op. cit.*, p. 396, *supra*—gave in hepatic dysentery 3 grains of calomel, 4 grains of ipecac. and half a grain of opium every three hours. When the danger was imminent, "the dose of calomel was augmented in such manner as to excite ptyalism as quickly as possible. When this took place, danger ceased and the patient soon became convalescent." This mode of treatment he tells us he first began to use in the year 1786. LATHAM—p. 62 *et seq.*, *op. cit.*, p. 439, *supra*—who sometimes gave large, sometimes small, doses, writes: "Our ultimate object, in all cases, was to produce salivation," p. 72, and this notwithstanding his belief in the scorbutic nature of the disease.

† BAMFIELD—p. 134 *et seq.*, *op. cit.*, p. 682, *supra*—although he dissented from the opinion that mercurials possess "the exclusive power of curing dysentery," used calomel freely enough both as a purge and for its constitutional impression. He even admitted the desirability of pushing the medicine to salivation—p. 138—but declared it "an object worthy of attention, to avoid the excitement of an unnecessarily profuse degree of ptyalism." BALLINGALL—p. 73, *op. cit.*, p. 682, *supra*—discountenanced the use of calomel in acute dysentery, but strenuously urged its employment in the chronic forms—p. 80—in which he regarded it "as a *sine qua non* in the cure;" yet he strongly protests against "the profuse salivations, which many suppose necessary." CHEYNE—p. 44, *op. cit.*, p. 686, *supra*—always laid aside the mercurial when ptyalism was recognized, and declared that "when the disease, as we conceived, had attained the ulcerative stage, mercury, which was given on the authority of Clarke, was injurious."

‡ ANNESLEY—Vol. II. p. 287, *op. cit.*, p. 621, *supra*: "Mercury, when given, either in simple or complicated dysentery, late in the disease, with a view of affecting the system, or when its exhibition is continued with this intention for too long a period, often seems to precipitate the malady to an unfavourable termination, by inducing or keeping up irritative fever, and by lowering the powers of life." And again: "Endeavours to excite ptyalism by too frequent and too long an exhibition of mercury, are generally most pernicious," p. 290. But he adds that it should "be viewed, when it does occur, as a satisfactory indication of the beneficial operation of this treatment, and of the removal of the disease." In an earlier work—*Sketches of the most prevalent Diseases of India*, London, 1825, Part III, *Practical obs. on the effects of calomel on the mucous surface and secretions of the alimentary canal; and on the use of this remedy in disease, more particularly in the diseases of India*—ANNESLEY relates—p. 383—that he had given calomel only in moderate doses until he perused the work of JOHNSON, which induced him to try scruple doses. His success led him to advise in acute dysentery the administration of a scruple of calomel at bed time, followed by a purgative draught next morning, p. 437; after which he often directed three grains of calomel with three or four of ipecacuanha, and one of opium, to be taken three times a day, "to act upon the skin, and upon the liver, through the medium of a partial absorption;" but he says: "Care must be taken not to continue the remedy until it shall affect the mouth, which ought not in any case to be made sore by it," p. 438. In the same treatise he relates—p. 389 *et seq.*—certain experiments performed on dogs with large doses of calomel. These, he thought, showed that the effect of the drug was to diminish the vascularity of the mucous membrane of the stomach and intestine, and hence that its operation "is directly the reverse of inflammatory," p. 397. He also believed, from the effects observed when calomel is admixed with the tenacious mucus frequently found coating the intestinal mucous membrane in the dead human subject, that calomel administered during life renders the tenacious mucus formed there in disease more fluid, and suggests: "May not its operation upon this secretion in the duodenum be the means of removing such obstruction from the common duct, as this secretion may be considered to occasion; and thus it may effect a discharge of bile into the intestine, which was only prevented by the mechanical obstruction placed in its way," p. 399. He held further that small doses of calomel often repeated "will become absorbed," and "thus act immediately on the liver." They may thus cause distension of the gall-bladder which a purge of calomel will be required to relieve, p. 401. These speculations were long regarded as established facts by the majority of English, and I may add of American, physicians.

§ G. WADDELL—*On the diseases which prevailed among the British troops at Rangoon*, Trans. of the Med. and Phys. Soc. of Calcutta, Vol. III, 1827, p. 257—used scruple doses of calomel, and aimed at salivation either by the internal use of this drug or by frictions with mercurial liniment. JAMES BANKIER—p. 209 *et seq.*, *op. cit.*, p. 637, *supra*—strongly defended the use of scruple doses of calomel—p. 213—which he believed to exert a decidedly sedative effect—p. 227. As for the chronic cases, he held that "we never can in general depend on a complete cure unless we touch the gums, which shews the system fully under the influence of the remedy, and in general we are not safe until this be accomplished," p. 251. R. H. HUNTER—*Annual report of the diseases of H. M. 2nd or Queen's Royal Regiment*, (for 1837-8,) Trans. of the Med. and Phys. Soc. of Bombay, Vol. II. 1839, p. 32—used mercury in scruple doses; also used it to salivation. W. A. GREEN—*Howrah hospital report. Remarks of* 1837-38-39-40, Trans. of the Med. and Phys. Soc. of Calcutta, Vol. VIII, Part II, 1842, p. 173—did the same, remarking: "Salivation, when occurring after full and sufficient bleeding, I have generally found a favorable sign, not that I would aim at salivation as a means of curing the disease," p. 182. J. W. MOFFAT—*Med. hist. abstract of the first year's service in the East Indies of H. M.'s 14th reg. of light dragoons*, Trans. of the Med. and Phys. Soc. of Bombay, No. V, 1842, p. 141—obtained the mercurial impression by small doses repeated "till the system come under its influence," this he believed to be "the safeguard" in dysentery. W. RALEIGH—p. 72, *op. cit.*, last page—declared "that for the cure of acute dysentery the ipecacuan treatment is not worthy of that confidence which the mercurial treatment is fully entitled to."

But more moderate counsels gradually began to prevail. Already, in 1829, Twining preferred blue pill to calomel, and thought sufficient assistance could be obtained from either without producing salivation. In 1841 Macpherson earnestly denounced the injudicious manner in which calomel had been used in India, and expressed the opinion that milder measures ought to be employed. In the same year Murray, repeating the experiments of Annesley on a larger number of dogs, showed that erroneous conclusions had been arrived at in several respects, and demonstrated that considerable doses of the drug act as a direct irritant to the gastro-intestinal mucous membrane. Ewart expresses the opinion that these experiments exercised considerable influence in favor of moderation in the use of mercurials; be this as it may, we find already, in 1844, the declaration of Morehead that the use of large doses of calomel and the production of salivation were no longer common in the treatment of dysentery in India. It is, however, worthy of note that all these writers themselves employed calomel or blue pill, in what they were pleased to consider moderate quantities, both as cathartics and in small repeated doses, and attached much importance to this mode of treatment,* which is also spoken of approvingly in the treatise of Parkes and the later works of Morehead and Martin.† The general introduction

* TWINING—*loc. cit.*, p. 695, *supra*. In Vol. I, p. 70 *et seq.*, *op. cit.*, p. 608, *supra*, the same views are repeated. He combined the blue pill in five-grain doses with his ipecacuanha and gentian. Sometimes, however, he used calomel in the same way. A similar preference for blue pill is expressed by H. H. GOODEVE—*On the treatment of dysentery*, Trans. of the Med. and Phys. Soc. of Calcutta, Vol. VIII, Part II, 1842, p. 476—who writes that it is "equally powerful with calomel, in correcting the secretions, bowels and in producing a healthy action of the liver: and it does not in these cases irritate the alimentary canal in the same degree as the chloride of mercury." J. MACPHERSON—*Notes on some points of Indian practice*, The London Med. Gaz., Vol. XXVIII, 1841, p. 548—writes: "It cannot admit of a doubt that calomel and drastic purgatives have been most injudiciously used in this disease, and that a return to a milder mode of treatment will be attended with the most beneficial results." Yet he adds: "The combination of blue pill, ipecacuanha, gentian, and hyoscyamus, so commonly employed, is a most useful preparation." J. MURRAY—*Expts. illustrative of the physiological effects of calomel on the gastro-intestinal mucous membrane of dogs*, Trans. of the Med. and Phys. Soc. of Bombay, No. IV, 1841, p. 1—found that the administration of calomel to healthy dogs produced increased vascularity of the gastro-intestinal mucous membrane resembling, in the large intestine, the appearances observed in cases of acute dysentery—p. 16. The degree to which this condition was developed was greater in proportion as the dose was larger. It was "slightly marked after doses of five and ten grains," and "becomes more perceptible in doses of twenty and thirty grains, and is accompanied with more or less sanguineous effusion on the mucous surface, either in dots (like bleeding points) or in small streaks or patches." In doses of one to three drachms it produces, in addition, "capilliform injection of the peritoneal coat of the stomach and bowels," p. 12. He pointed out the error of the opinion of ANNESLEY, that the healthy state of the stomach and bowels is one of high vascularity, and repudiated the sedative effect which that observer attributed to large doses of the drug; yet agreed with him in believing that calomel increases the flow of bile into the duodenum, a conclusion at which both appear to have arrived solely from inspection of the intestinal contents and the stools. MURRAY also held that the drug "increases the secretion from the intestinal mucous follicles and serous exhalants," *loc. cit.* In a subsequent paper—*Obs. on the good and bad effects of calomel in some of the diseases of India*, same Transactions, No. V, 1842, p. 145—he maintained that calomel may be advantageously given in the early stages of dysentery, at considerable intervals, in 10 grain doses, (which he calls "full doses,") combined with two or three grains of opium. At a later period he thinks preference should be given to blue pill in small doses, also combined with opium. EWART—p. 363, *op. cit.*, p. 681, *supra*—remarks of MURRAY'S experiments: "They must have exercised considerable influence in deterring physicians from having recourse to the gigantic doses prescribed by Johnson, Annesley, and their disciples." C. MOREHEAD—*Notes on the pathology and treatment of dysentery as observed in the European gen. hosp. at Bombay during the five years from July*, 1838, *to July*, 1843, Trans. of the Med. and Phys. Soc. of Bombay, No. VII, 1844, p. 156—wrote: "The treatment of dysentery by large doses of calomel repeated and continued for some time, on the principle that such doses have a sedative action on the inflamed mucous coat, does not I think at present find much acceptance in this part of India; and I believe that it may fairly be assumed that a system of treatment strongly recommended and at one time generally followed, as this has been, would not have fallen into disuse, unless the expectations formed of its efficacy and applicability had led to disappointment. On this principle I would explain the comparative infrequency of the treatment of dysentery by large doses of calomel repeated and continued for some time. My own belief is that as a general system of treatment it is inappropriate and very often very injurious." Yet the writer in the same essay advises that during the first two or three days of attacks of dysentery, if the constitution of the patient is not broken down by former disease or other cause, ten grains of calomel with a grain and a half or two grains of ipecacuanha, and the same quantity of opium should be given at bed time, followed next morning by from six drachms to an ounce of castor oil; this may be repeated twice or thrice, in accordance with the condition of the tongue, the character of the dejections and the degree of abdominal distention. As to the induction of the mercurial impression, he remarks: "I am not aware that recent writers are in favour of this course," p. 155. He thinks it might be useful if there is "considerable thickening of the walls of the large intestines" without ulceration, but it must be difficult or impossible to recognize this condition, so that "there is good reason for not recommending, as a general course, the treatment of dysentery by this means."

† PARKES—p. 142 *et seq.*, *op. cit.*, p. 682, *supra*—deprecated the induction of salivation, and pointed out its injurious effects, especially in adynamic or malignant dysentery, and in cases complicated by a scorbutic taint or by hepatic abscess. As to large doses, such as ANNESLEY commended, he wrote: "I have often seen profuse salivation produced, which Mr. Annesley professes to avoid. I have witnessed in many cases aggravation of the tenesmus, and increase of blood in the stools, and as calomel, in poisonous doses, in men and dogs, causes intense and hæmorrhagic congestion of the colonic and rectal mucous membrane, I am unable to conceive the therapeutical indications on which its use is founded." Yet even he favored the cautious use of mercury as an alterative, or as a substitute for depletion, for he adds: "For my own part I have ceased to use mercury in dysentery, in any other way than as an alterative, except in chronic and long protracted and recurrent acute cases. I never aim at ptyalism, and can confidently assert that my recoveries have been greater in number, and more complete, since I in a great measure abandoned the use of mercury, than when I gave it in large quantities. If, from any cause, depletion cannot be used, then, in common acute dysentery, mercury must be had recourse to, as the next most useful plan of treatment," p. 145. On p. 146 also he enumerates the "occasional production of salivation" among the "essential measures in the early stage of common acute dysentery." In at least one form of chronic dysentery also he declares that "mercury is really the most valuable medicine that can be used," p. 151. For this purpose he especially commends corrosive sublimate in doses of $\frac{1}{8}$ to $\frac{1}{6}$ of a grain combined with the preparations of cinchona. MOREHEAD—p. 296, *op. cit.*, p. 657, *supra*, in the second edition of his work, published in the year 1860—reiterates substantially the views advanced in the paper cited in the last note. He remarks, in almost the words of that paper: "The object in exhibiting calomel is to increase the secretion of the liver and of the mucous lining of the

of the ipecacuanha treatment in India has, however, since 1860, pretty generally crowded out the calomel fashion; it has fallen for the most part silently into disuse, although some practitioners, as for example Maclean, openly deprecate its employment in all stages and forms of dysentery.*

In the temperate climate of Great Britain the heroic doses of calomel advised by Johnson and Annesley never secured the universal confidence they so long enjoyed in India. The feeling was very general that this method was only appropriate for tropical dysentery, and that milder measures might be employed in England.† Yet although the publication of the experience of Roots, who found that in many instances of chronic dysentery calomel, even in combination with opium, appeared to increase the irritability of the bowel, was followed by the testimony of Baly, who sometimes observed similar results in acute cases,‡ these objections did not prevent the very general employment of small doses of calomel combined with opium and ipecacuanha, and repeated with a view to the alterative effect of the mercurial. Blue pill, or hydrargyrum cum creta, was sometimes used instead of calomel for this purpose. Baly himself approved this treatment, which was commended among others by Copland, Joseph Brown and Mayne,§ and has only passed out of general use in comparatively recent times.

Pills of calomel, opium and ipecacuanha have also, since 1834, enjoyed a certain degree of popularity in France, where they are often spoken of with national vanity as the "*pilules de Ségond.*" But Ségond himself never claimed the credit of this combination, which he honestly states he borrowed from the English physicians in Demerara, by whom he relates it was employed with considerable success.‖ Erhel found these pills serviceable in mild but not in grave dysenteries; Savignac was inclined to restrict them to chronic cases, and Barrallier affirms that even in these they are only sometimes useful.¶ The French physicians appear to have acquired a knowledge of the use of large doses of calomel

small intestine, but at the same time to be careful that it does not aggravate the existing inflammation of the large intestine. This latter injurious effect is to be guarded against by avoiding the frequent repetition of the calomel, and by combining it, when used, with opium." MARTIN—p. 441, *op. cit.*, p. 621, *supra*—not merely commended purgative doses (10 grains) of calomel combined with an equal quantity of James's powder or ipecacuanha, but thought it proper often to combine "some mild mercurial," such as blue pill or calomel, with the diaphoretics and diuretics subsequently administered; but he did not favor pushing it to ptyalism, and thought that mercury should not be used in any shape in the adynamic forms of the disease, or in the splenic cachexia, "for in all these conditions of the system its actions are most injurious," p. 458.

* MACLEAN—Vol. I, p. 124, *op. cit.*, p. 657, *supra:* "It will not fail to be remarked that I have not only not advised but by implication have deprecated the use of mercury in all stages and forms of the disease." He offers as reasons, besides the objections to ptyalism, and the superiority of the ipecacuanha treatment, &c., the important statements that "experience has shown that men 'cured' by mercurial treatment are as a rule cachectic, exsanguine, prematurely old-looking, extremely sensitive to atmospheric changes and to relapses from trivial causes;" and that "chronic dysentery is more frequent after mercurial treatment than when the disease is treated by ipecacuanha."

† Thus JOSEPH BROWN—*Dysentery*, The Cycl. of Pract. Med., Amer. Ed., Vol. I, Philadelphia, 1845, p. 726—writes: "It is a remedy more generally applicable to dysentery in warm latitudes than in this country."

‡ ROOTS—*Chronic dysentery*, St. Thomas's Hosp. Reports, Vol. I, 1836, p. 272. BALY—p. 536, *op. cit.*, p. 535, *supra.*

§ BALY—*loc. cit.*, last note. COPLAND—Vol. I, p. 731, *op. cit.*, p. 682, *supra.* JOSEPH BROWN—*loc. cit.*, note †, *supra:* "A grain or a grain and a half of calomel, combined with from five to ten grains of Dover's powder, or half a grain of opium; or five grains of hydrargyrum cum creta, likewise combined with the opiate; may in this country be administered at intervals of four hours, the period being lengthened when the symptoms begin to abate. It is not necessary to excite ptyalism, although this is a contingency from which no evil result need be apprehended, provided the medical attendant be sufficiently watchful of the effect of the remedy to prevent its being excessive." R. MAYNE—*Obs. on the late epidemic dysentery in Dublin*, The Dublin Quart. Jour. of Med. Sci., Vol. VII, 1849, p. 303: "Two grains of calomel, with three of Dover's powder, every fourth hour, usually succeed, even in the most acute varieties of the disease; and much smaller quantities, or even hydrarg. cum creta, or blue pill, have been sufficient in many cases." But he remarks: "I feel convinced that when the gums are once fairly affected by calomel its further exhibition does no good in dysentery."

‖ SÉGOND—p. 163, *op. cit.*, p. 695, *supra*—gives the English formula as employed in Demerara as follows: "Il administrent (en 4 ou 5 fois dans les 24 heures), un mélange de 8 g. d'ipéca, 2 de calomel, et ¼ de grain d'opium." He adds: "Le ptyalisme s'en suit presque toujours." Elsewhere—*Documents relatifs a la méthode éclectique employée contre la dysenterie*, Paris, 1836, p. 48—he recommends the following formula: "℞ Ipeca gr. viij, calomel gr. iv, extr. gom. d'opium gr. j, gom. arabique q. s. Faites six pilules, à prendre dans la journée de deux en deux heures." But he remarks in a foot note that the proportion of the several ingredients ought to vary according to the particular indications of each case. SAVIGNAC—p. 371, *op. cit.*, p. 620, *supra*—relates the manner in which SÉGOND'S name came to be attached to these pills, as follows: "Ségond, médecin en chef à la Guyane française se emprunta aux médecins de la colonie anglaise de Démérary une formule dont il proclama avec ardeur les vertus antidysentériques; les médecins de Cayenne, témoins des succès qu'il en obtint, y attachèrent son nom."

¶ H. D. ERHEL—*Étude sur la dysenterie*, Paris thesis No. 254, 1851, p. 57 *et seq.*—was of the opinion that ipecacuanha was most suitable for mild, and calomel for severe dysenteries; the pilules of Ségond he regarded as inefficient in serious cases. SAVIGNAC—*loc. cit.*, last note. BARRALLIER—p. 779, *op. cit.*, p. 603, *supra*—writes: "Nous pouvons le dire avec vérité, il résulte des travaux des médecins de la marine française et de notre experience personnelle que la formule de Ségond ne convient qu'exceptionnellement dans la dysenterie aiguë et qu'elle est quelquefois utile dans l'état chronique."

in dysentery chiefly through reports of the success of the English army surgeon Amiel at Gibraltar in 1812.* Trousseau relates that Bretonneau and himself endeavored to emulate these results during the Touraine epidemic, but were obliged to abandon the method on account of the severe salivation sometimes produced. He was led ultimately to administer calomel only in the minute doses suggested by Robert Law, of Dublin, in 1839; but appears to have given these rather with a view to the purgative action of the drug than to the constitutional impression which Law aimed at obtaining in this way, and to have employed them, especially in the case of children, as a substitute for the saline purgatives which he preferred for adults.†

On the other hand, several of the French surgeons in Algeria claimed to have obtained beneficial results with calomel in purgative doses. Cambay gave a gramme at bed time combined with five centigrammes of opium, and followed next morning by a laxative, and claimed that he had successfully treated about two hundred cases in this manner.‡ Catteloup not only used purgative doses of calomel, but sometimes employed the "*pilules de Ségond*" in the subsequent treatment;§ and Haspel went so far as to give one or two grammes of calomel a day in combination with opium and ipecacuanha.‖ In like manner Savignac favored the use of calomel as a purgative in the inflammatory form of dysentery and whenever it was desired to increase the obstinately suspended hepatic secretion; he also revived the once famous combination of calomel and rhubarb.¶ Jaccoud commended the same plan of treatment, and declared that the efficacy of calomel in dysentery is truly marvellous.** So, too, Barrallier regarded purgative doses as useful not only in inflammatory cases, but whenever the stools are bloody or the disease severe.††

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* I have not been able to see the original memoir of AMIEL, an abstract of which is given by F. P. E. MEUSNIER—*De la dysenterie épidémique*, &c., Paris Thesis No. 99, 1830, p. 24: "Mon ami M. le docteur Trousseau, professeur aggrégé à la Faculté de médecine de Paris, m'a communiqué un mémoire fort curieux de M. AMIEL, chirurgien-major du 12e régiment de ligne, actuellement en garnison à Gibraltar." He goes on to relate that dysentery was epidemic at Gibraltar in 1815, that AMIEL treated it with calomel in half-drachm doses, given morning and evening, for from three to six days, and that this treatment was so successful that it was adopted by the surgeons of all the other regiments at Gibraltar. TROUSSEAU himself—*loc. cit.*, next note—relates the same story, but makes the date 1812, and adds: "Le succès de la médication fut tel, que la direction générale du service de santé militaire en fit une loi absolue pour tous les autres médecins." So, too, in the *Traité de Thérapeutique et de Matière Médicale* of TROUSSEAU and PIDOUX, 3me Éd., Paris, 1847, T. I, p. 228, I find the treatment of dysentery with 2 grammes of calomel morning and evening mentioned, with the remark, "C'est à M. le docteur Amiel, chirurgeon-major du 12e régiment de ligne de l'armée anglaise, qu'est dû le mérite d'avoir le premier formulé d'une manière nette cette méthode de traitement." The date given in this work also is 1812. BARRALLIER—*loc. cit.*, next note—accordingly speaks of the use of large doses of calomel in dysentery as "méthode d'Amiel." This surgeon, however, does not deserve the credit or blame of having originated this method, which we have seen was in common use among the English naval surgeons before 1812, and, in view of its reputation in France, it is curious that I have found no reference to the memoir mentioned above in any English work.

† TROUSSEAU—T. III, p. 168, *op. cit.*, p. 664, *supra*—held that the action of calomel in dysentery was probably exclusively local and similar to that of the neutral salts. After relating the story of his earlier trials of this drug, he adds: "J'ai donné le calomel, *fractis dosi*, suivant la méthode de Law, c'est-à-dire 5 centigrammes (un grain) divisés en 10 paquets, qui étaient administrés d'heure en heure. Cette méthode de traitement m'a paru surtout avantageuse chez les enfants, auxquels il est souvent difficile de faire accepter les purgatifs salins." ROBERT LAW—*Obs. on the exhibition of mercury in minute doses*, The Dublin Jour. of Med. Sci., Vol. XIV, 1838-9, p. 393—insisted particularly upon "the very small quantity of mercury required to affect the system, when exhibited in minute doses at short intervals." He gave hourly $\frac{1}{12}$ of a grain of calomel made into a pill with extract of gentian. From two to four grains administered in this way salivated. Under the name of "méthode de Law" the procedure above described by TROUSSEAU is mentioned by SAVIGNAC—p. 369, *op. cit.*, p. 620, *supra*—who, however, prefers to administer hourly four or five times the quantity, as less likely to salivate; and by BARRALLIER—p. 778, *op. cit.*, p. 603, *supra*—who remarks: "Aussi la méthode de Law, qui peut être conservée dans le traitement de la dysenterie des enfants, est-elle aujourd'hui repoussée par presque tous les médecins chez les adultes."

‡ CAMBAY—p. 569 *et seq.*, *op. cit.*, p. 550, *supra*. § CATTELOUP—p. 132 *et seq.*, *op. cit.* p. 618, *supra*.

‖ HASPEL—T. II, p. 125, *op. cit.*, p. 621, *supra*—gave, with one or two grammes of calomel, from six decigrammes to a gramme of ipecacuanha and ten or twelve drops of laudanum. He writes: "A l'aide du protochlorure de mercure employé au début de la dysenterie, si les malades n'ont pas fait de grandes pertes de sang, je suis parvenu à juguler des dysenteries qui auraient pu devenir très graves."

¶ SAVIGNAC—p. 365 *et seq.*, *op. cit.*, p. 620, *supra*—writes that in his early practice he used calomel freely, but the inconveniences resulting from its use and its frequent insufficiency have led him to limit its employment greatly. In the cases indicated in the text he thinks its purgative action useful, but he regards its alterative action profitless. He gives a gramme at a single dose, or divided into three or four parts, which are taken at intervals of quarter or half an hour; or he administers 20 to 30 centigrammes divided into powders of 25 milligrammes each, one of which is taken every hour. This latter method he calls "la méthode de Law modifiée:" see note †, *supra*. Finally, he employs sometimes the following: "Calomel, 50 centigrammes; rhubarbe, 2 grammes; opium, 3 à 5 centigrammes,—pour 15 pilules, que je donne à doses rapprochées ou filées, selon les cas."

** S. JACCOUD—T. II, p. 340, *op. cit.*, p. 619, *supra*—gives the calomel solely for its purgative effect, and prefers to the "méthode de Law" the administration of a gramme and a half to two grammes at a dose, repeated if necessary morning and evening; or a gramme or two of calomel divided into ten powders, one to be taken every hour.

†† BARRALLIER—*loc. cit.*, note †, *supra*: "Entre les éloges outrés adressés au calomel par un grand nombre de médecins anglais et les appréciations sévères de Morehead, il y a un juste milieu qu'il est important de suivre. Ce médicament est utile lorsqu'on constate la présence d'un état d'éréthisme inflammatoire, lorsque les selles sont sanglantes et dans tous les cas où la dysenterie offre un notable degré de gravité."

In Germany purgative doses of calomel in dysentery were recommended as early as 1793 by Richter, who declared that he knew no other purgative at once so powerful and so gentle in its action. It would appear, also, from his posthumous work on Special Therapeutics, that he sometimes gave at bedtime a combination of a grain each of calomel, opium and ipecacuanha for its diaphoretic action.* Since his time both large and small doses of calomel have had their partizans in Germany. The former have been advocated, among others, by Kreyssig, Hauff, Rösch, Siebert, Berndt, Schweich and Canstatt.† Smaller doses, pushed to salivation, were commended in 1834 by Eisenmenger, who relates that he learned this method from a friend who had practiced medicine in Batavia. He gave every three hours a pill containing one grain of calomel, two of ipecacuanha and quarter of a grain of opium, and claimed that after salivation occurred the symptoms rapidly subsided. This method had some vogue for a time, and is mentioned with approval by Naumann and Hauff.‡ Bamberger, on the other hand, appears to have regarded the use of large doses of calomel with distrust, for he writes that he had no such personal experience of their effects as would justify the expression of an opinion. The action of small doses, generally combined with opium, he observed quite frequently; often a favorable result followed, but it was not more striking than the results which were observed as often after other treatment, and sometimes stomatitis mercurialis or even noma ensued.§ Vogt, however, speaks favorably of the use of calomel both as a purgative, and later in the disease in small repeated doses.‖ Even Niemeyer sanctioned the employment of the latter measure in severe cases of dysentery and in those which resist milder measures,¶ and Heubner refers to it without censure, although he gives greater prominence to the purgative use of the drug.**

In the United States the use of calomel, both in purgative doses and in small doses frequently repeated, found general favor in the treatment of dysentery from an early period in the present century. These measures were advocated by Thacher, Hosack, Eberle, Chapman, Dunglison, Dickson and G. B. Wood.†† At the commencement of the civil war

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* Aug. Gottlieb Richter—*Med. u. chir. Bemerkungen*, Bd. I, Gottingen, 1793, S. 97: "Ich versichre; kein Purgirmittel wirkte so kräftig und zugleich so gelinde, als das Calomel." For the combination of calomel, opium and ipecacuanha mentioned in the text, consult *Die spec. Therapie nach den hinterlassenen Papieren des verstorbenen D. Aug. Gottl. Richter*, &c., herausgegeben von D. Georg. Aug. Richter, 3te Aufl., Bd. II, Berlin, 1821, Abth. 2, S. 134.

† Kreyssig—*Dysenteria*, Encyclopädisches Wörterbuch der med. Wiss., Bd. IX, Berlin, 1833, S. 657 *et seq.*—commended purgative doses of calomel, especially in inflammatory and bilious dysentery. Hauff—S. 408, *op. cit.*, p. 534, *supra*—commends it in combination with rhubarb, especially in the gastric and bilious forms. Rösch—*Geschichte des Vorkommens der Ruhr in dem Bezirke des Verfossers in den Jahren* 1834 *bis* 1837, *mit ausführlicher Schilderung der Epidemie von* 1837 *und ihrer Behandlung*, Medicinische Annalen, Bd. V, 1839, S. 443—gave half-scruple or even scruple doses, which he repeated, if necessary, twice, three times or even oftener, during the Schwenningen epidemic of 1837. A. Siebert—*Zur Genesis und Therapeutik der rothen Ruhr*, &c., Bamberg, 1839, S. 155—gave two to three grains of calomel every two hours, repeated until the often-described green stools made their appearance. He did not aim to produce ptyalism, but did not regard its occurrence as a serious matter, S. 147. Berndt—*Klin. Mittheil.*, Hefte 3, u. 4, Greifswald, 1840, S. 224—wrote: "Ja, die Behandlung mit grossen Gaben von Calomel wirkt so sicher, dass man in 36–48 Stunden Herr des ganzen Krankheitszustandes werden kann." Schweich—*Ruhr*, Encyklopädie der Gesammten Med., Bd. V, Leipsic, 1842, S. 329—regarded calomel in large doses as a direct antiphlogistic, and declared that its use has found no decided opposers. C. Canstatt—*Spec. Path. u. Ther.*, 3te Aufl., (Henoch.) Bd. I, Erlangen, 1854, S. 523—gave the preference to scruple or half-scruple doses, once or twice daily, and remarks: "Auch wir halten nach eigener Erfahrung dieses Mittel für eines der wichtigsten und haben beobachtet, dass dasselbe, richtig angewendet, oft rasch die Intensität der Krankheit bricht und ihren Verlauf mildert und abkürzt."

‡ Eisenmenger—*Bemerkungen über die Behandlung der Ruhr*, Med. Correspondenz-Blatt des Württembergischen ärzt. Vereines, Bd. III, 1834, S. 33. Compare Naumann—Bd. IV, Abth. 2, S. 87, *op. cit.*, p. 645, *supra*—and Hauff—S. 409, *op. cit.*, p. 534, *supra*.

§ Bamberger—S. 416, *op. cit.*, p. 578, *supra*. ‖ Vogt—S. 179 *et seq.*, *op. cit.*, p. 645, *supra*.

¶ Niemeyer—Bd. II S. 756, *op. cit.*, p. 645, *supra*: "Man gibt gewöhnlich 2 stündlich gr. j Kalomel mit gr. ¼ Opium, und ich glaube, dass diese Form, zumal wenn man ausserdem Abends 5–10 Gr. Pulv. Doweri reicht, den Vorzug vor den gleichfalls empfohlenen grossen Dosen Kalomel (9ss) verdient."

** Heubner—S. 545, *op. cit.*, p. 529, *supra*.

†† James Thacher—*American Modern Practice*, Boston, 1817, p. 589—not only sometimes used calomel as a cathartic, but remarked: "During the intervals of the operation of the cathartics, small doses of calomel and opium, as directed in fevers, will be productive of excellent effects, by opening the secretions, deterging the intestines, and abating distressing pain." David Hosack—*Lectures on the Theory and Practice of Physic*, edited by his friend and former pupil, H. W. Ducachet, Philadelphia, 1838, p. 304—preferred the saline cathartics to calomel in purgative doses, but expressed the opinion that the latter "is doubtless a valuable medicine in this disease," and "especially when administered as a sudorific, in combination with small doses of antimony, or James' powder or with ipecacuanha." John Eberle—*A Treatise on the Practice of Medicine*, 5th Ed., Philadelphia, 1841, Vol. I p. 249—commended the administration of 10 to 12 grains of calomel as a purgative early in dysentery. He says: "Calomel should always form a part of our laxative remedies in this disease, particularly in its early stage;" and that "Calomel, with a view to its constitutional influence, is a remedy of excellent powers in this disease." As a diaphoretic he commends the following: "℞.—Pulv. ipecac. compos. gr. xxiv. Submuriatis hydrarg. gr. vi.—M. Divide

they were at the height of their popularity. The clinical observations of Austin Flint had, indeed, a few years before, proved "adverse to the opinion of any favorable influence being exerted by this remedy on the morbid processes involved in the disease;" but he himself had admitted that the number of his observations was "insufficient to settle positively this practical question;" and his cautious criticism of the popular practice does not appear to have borne much fruit.* Even in the essay of Stillé, distributed to the medical officers of our armies by the Sanitary Commission at an early period of the war, although the author cautions against the dangers of the "primary depressing influence" of the drug, and the possibility of its occasioning salivation or "the other and remoter effects of mercurial poisoning," and declares it to be the duty of the army surgeon not to employ mercury, whether in large or in small doses, unless simpler remedies prove inefficacious,† there are several passages in which he commends the administration of calomel under particular circumstances, both in purgative and in small repeated doses.‡

Accordingly it is not remarkable that calomel figured largely in the treatment of dysentery both in the field and in general hospitals, as is shown by the official reports§ and articles published in the American medical journals,‖ and as all who had an opportunity for observation at the time will well remember. It was also freely used in other diseases by many American physicians, especially in pneumonia and the phlegmasiæ generally. A great sensation was therefore created, both in the army and among practitioners in civil life, by the Circular of Surgeon General Hammond, issued May 4, 1863, which, after reciting that the reports of medical inspectors and the sanitary reports received at his office showed that the administration of calomel was so frequently pushed to excess by the

into six equal parts. S. Give one every three or four hours," p. 242. CHAPMAN, in his lectures—*A Compendium of Lectures on the Theory and Practice of Medicine, delivered by Professor Chapman, in the University of Pennsylvania. Prepared with permission, from Dr. Chapman's manuscripts, and published with his approbation*, by N. D. BENEDICT, Philadelphia, 1846, p. 133—commended mercurial purges in the early stages of the dysenteries of warm weather, and later in the disease directed "opium in combination with calomel and ipecacuanha." ROBLEY DUNGLISON—*The Practice of Medicine*, 3d Ed., Phila., 1848, Vol. I, p. 113—remarks that, "in those cases, that are accompanied by signs of great prostration, * * * the strength may have to be supported, whilst every effort is made to induce a new action in the system by means of mercurials." S. H. DICKSON—*Elements of Medicine*, Phila., 1855, p. 534—not only gave calomel in acute dysentery, but says of the treatment of chronic dysentery—p. 531—"I would advise a mercurial course, combining small doses of calomel or of blue mass, with ext. pp. or Dover's powder, repeating at proper intervals throughout the day, and administering full doses of anodyne at night." G. B. WOOD—Vol. I, p. 573, 1st Edit., cited p. 691, *supra:* "Not only is calomel useful in the commencement as a purgative, but afterwards also, in smaller doses, so as to stimulate the hepatic secretory function, and sustain a flow of bile into the bowels. * * * Two grains of opium, from two to four of ipecacuanha, and from two to four of calomel, may be made into four pills, two of which may be given at once, and one every hour or two afterwards till rest is procured. * * * If the disease should not begin to yield in six or seven days, the mercurial may be more freely administered, so as to affect the mouth. * * * No remedial influence is more effectual in dysentery than that of mercury." In chronic dysentery he favored the use of blue pill, remarking: "Pushed to moderate salivation, it will undoubtedly often effect cures; and this measure should always be resorted to if others fail," p. 580. These teachings are repeated without modification in the sixth edition of his work, Phila., 1866, Vol. I, p. 721 *et seq.*

* AUSTIN FLINT—p. 210, *op. cit.*, p. 710, *supra.* † STILLÉ—p. 370, *op. cit.*, p. 650, *supra.*

‡ *E. g.*, its use as a purge is commended in mild dysentery (10 to 20 grains followed by castor oil) on p. 361; in bilious dysentery (20 grains of ipecacuanha with 10 or 15 of calomel as an emeto-cathartic) on p. 370. On p. 365, speaking of inflammatory dysentery, he writes: "If the patient is not of a vigorous constitution and is not affected with purely sthenic dysentery, purgative doses of calomel are preferable to the salines. These should be prescribed in the dose of twenty grains, with a grain of opium in a single dose, or in two or three doses of from five to ten grains of calomel, and one grain of opium in each, to be taken at intervals of six or eight hours, and followed, after a similar space of time, by an ounce of castor oil." In the same connection, after directing for the subsequent treatment, "Five-grain doses of Dover's powder every five or six hours, or from three to five grains of ipecacuanha, with half a grain or a grain of opium at like intervals;" he adds: "If the sthenic character of the symptoms be still decided, a grain of calomel may be added to each dose of either of the powders just referred to. But such an addition is not generally advisable, owing to the risk of inducing salivation."

§ Thus, among the reports in Section II, purgative doses of calomel or blue mass, or "mercurial cathartics," alone or in combination, are commended by VAN SLYCK—p. 66, *supra;* BRADLEY—p. 67, *supra;* MARTIN—p. 73, *supra;* BRETZ and MULFORD—p. 80, *supra;* BROWN—p. 81, *supra;* STRONG—p. 84, *supra;* SANBORN and HUNT—p. 94, *supra;* and COFFMAN—p. 97, *supra.* The alterative use of calomel, hydrargyrum cum creta, blue pill, or "mercurials," is commended by SCHÜSSLER—p. 44, *supra;* BENJ. WOODWARD—p. 51, *supra;* SCHELL—p. 70, *supra;* LEE—p. 71, *supra;* FOYE—p. 73, *supra;* BROWN—p. 77, *supra;* WHITE—p. 85, *supra;* GRANGER and PECK—p. 86, *supra;* PYLE—p. 91, *supra;* and GAGE—p. 93, *supra.* I suppose the same drug to be indicated by the euphemistic term "alteratives," commended by some of the reporters, *e. g.:* YORK—p. 88, *supra;* MILLER—p. 89, *supra;* and BATES—p. 99, *supra.*

‖ See, for example, Surgeon J. F. HAMMOND, U. S. A.—p. 69, *op. cit.*, p. 697, *supra;* Surgeon J. H. THOMPSON, 12th Maine vols.—*Letter to Editor*, Boston Med. and Surg. Jour., Vol. LXVI, 1862, p. 338; T. H. WALKER—*op. cit.*, p. 708, *supra;* A. D. COSBY—p. 154, *op. cit.*, p. 626, *supra*—who strongly commends scruple doses of calomel, and claims to have successfully treated in this manner a large number of cases of dysentery in the 17th Kentucky volunteers a month before the battle of Shiloh. In the fall of 1862 he used the same treatment in the 35th Kentucky mounted infantry: "I served with the regiment six months, and can now truthfully say that not a man died, not one was discharged from service, or sent to general hospital on account of diarrhœa, during that time, as my monthly reports will show." See also, Asst. Surgeon GEO. WINCH, 29th Wisconsin vols.—*Camp diarrhœa near Vicksburg*, Chicago Med. Jour., Vol. VI, 1863, p. 346; and J. R. BLACK—*op. cit.*, p. 708, *supra.*

military surgeons as to call for prompt measures to correct the abuse, directed that it be struck from the supply table of the army, and that no further requisitions for this medicine should be approved by Medical Directors.*

Although the promulgation of this circular was defended in several articles, which appeared in contemporary medical journals,† it was fiercely attacked and violently denounced in others.‡ A few weeks after it appeared the medical profession of the city of Cincinnati held a meeting, at which several physicians, who had made more or less extensive observations in the western armies and general hospitals, utterly denied the existence of the alleged abuses; a passionate report was adopted, which strikingly indicates the prevailing indignation.§ The American Medical Association met in Chicago, June 2d. A committee of one from each state was appointed to consider the Surgeon General's circular; they made a temperate and carefully considered but firm report, expressing their belief "that the charge of wholesale malpractice made by the Surgeon General is unjust to the army surgeons;" presented, in support of this belief, the testimony of a number of prominent physicians who had had opportunities for observation in both the eastern and the western armies, and

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* The following is the text of this circular:

"(Circular No. 6.) SURGEON GENERAL'S OFFICE, *Washington, D. C., May* 4, 1863.

"I. From the reports of Medical Inspectors and the Sanitary reports to this office, it appears that the administration of calomel has so frequently been pushed to excess by military surgeons as to call for prompt steps by this office to correct this abuse; an abuse the melancholy effects of which, as officially reported, have exhibited themselves not only in innumerable cases of profuse salivation, but in the not infrequent occurrence of mercurial gangrene. It seeming impossible in any other manner to properly restrict the use of this powerful agent, it is directed that it be struck from the Supply Table, and that no further requisitions for this medicine be approved by Medical Directors. This is done with the more confidence as modern pathology has proved the impropriety of the use of mercury in very many of those diseases in which it was formerly unfailingly administered.

"II. The records of this office having conclusively proved that diseases prevalent in the Army may be treated as efficiently without tartar emetic as therewith, and the fact of its remaining upon the Supply Table being a tacit invitation to its use, tartar emetic is also struck from the Supply Table on the Army. No doubt can exist that more harm has resulted from the misuse of both these agents, in the treatment of disease, than benefit from their proper administration. W. A. HAMMOND, *Surgeon General.*"

It has been already shewn—note §, p. 690, *supra*—that so far as this order relates to tartar emetic it was not without precedent. The reader will be interested to learn that a similar order with regard to calomel was contemplated in the year 1841 by military medical authority in India: J. MACPHERSON—p. 548, *op. cit.*, p. 714, *supra*—after expressing the opinion that calomel has been much abused in the treatment of dysentery in India, writes: "Indeed, it has been stated, that the present distinguished Inspector General proposes to issue an order, forbidding the use of calomel among the Queen's troops." I find no record that this proposed order was actually issued. On the other hand, if we may believe TROUSSEAU—*loc. cit.*, note *, p. 716, *supra*—a military order compelling all surgeons in the English service to use large doses of calomel in the treatment of dysentery was actually issued in 1812 in consequence of the success of this method in the hands of AMIEL at Gibraltar. I have been unable to corroborate this statement by any English authority.

† I note the following articles as more or less distinctly taking a favorable view of the circular: EDITORIAL—*Calomel and tartar emetic in the army*, Amer. Med. Times, Vol. VI, 1863, p. 297; Surgeon C. C. COX, U. S. vols.—*Remarks before the Amer. Med. Ass. on the order of the Surgeon General*, same Vol., p. 299; EDITORIAL—*Calomel and tartar emetic as remedial agents*, same Jour., Vol. VII, 1863, p. 8; "ILLINOIS"—*Calomel and tartar emetic in the army*, same Vol., p. 103; "AN INTELLIGENT ASSISTANT SURGEON OF A REGIMENT IN THE FIELD"—*Calomel and tartar emetic*, The Med. and Surg. Reporter, Vol. X, 1863, p. 275; EDITORIAL—*Calomel and tartar emetic as remedial agents*, Buffalo Med. and Surg. Jour., Vol. III, 1863, p. 32; J. F. HIBBERD—*Circular No. 6 and the profession*, The Cincinnati Lancet and Observer, Vol. VI, 1863, p. 429; and by the same—*Circular No. 6 again*, same Vol., p. 483; EDITORIALS—*The Surgeon General's order; calomel and antimony*, The Chicago Med. Jour., Vol. VI, 1863, p. 285, and *Calomel in the army*, same Vol., p. 310; EDITORIAL—*Surgeon General Hammond's anti-calomel and antimony order*, The San Francisco Med. Press, Vol. IV, 1863, p. 116. I may add that on examining the letter files of the Surgeon General's Office for 1863, I find letters expressing approval of the circular from Surgeon L. J. DIXON, 1st Wisconsin vols., May 31; Asst. Surgeon J. H. SHOOT, 4th Mo. state militia cavalry, June 1; Dr. J. W. HITCHCOCK, late surgeon 18th Indiana vols., June 9; Surg. E. BENTLEY, U. S. vols., June 30; Prof. J. A. ALLEN, Rush Medical College, July 7; Dr. WM. SWEETSER, New York, July 10; Dr. E. INGALS, Chicago, July 11; Surg. P. A. JEWETT and nine members of the surgical staff of the Knight Hospital, New Haven, July 14; Prof. J. KNIGHT, Yale College, July 15; also a letter from Surg. G. W. RAMSAY, 95th New York vols., expressing agreeable surprise at the order, and hoping that iodide of mercury may be issued instead of calomel, and one from Dr. GEO. H. GAY, of Boston, received October 13, 1863, in which the writer expresses an opinion "adverse to a routine use in the army, of either calomel or tartar emetic."

‡ I note on this side the following articles: E. P. BENNETT—*Removal of calamel and tartar emetic from the supply list*, Amer. Med. Times, Vol. VI, 1863, p. 298; Z. PITCHER—*Calomel and tartar emetic in the army*, same Jour., Vol. VII, 1863, p. 53; see also Med. and Surg. Reporter Vol. X, 1863, p. 213; C. G. C.—*Circular No. 6*, same Vol., p. 139; EDITORIAL—*Calomel and tartar emetic*, Med. and Surg. Reporter, Vol. X, 1863, p. 77; EDITORIAL—*Surgeon General Hammond*, Ohio Med. and Surg. Jour., Vol. XV, 1863, p. 448; EDITORIALS—*Circular No. 6*, The Cincinnati Lancet and Observer, Vol. VI, 1863, p. 369; *Surgeon General Hammond's circular No. 6*, same Vol., p. 440; *Circular No. 6 once more*, same Vol., p. 497; *The Surgeon General in a new order*, same Vol., p. 553; Surg. J. R. BLACK, 113th Ohio vols.—*Letter*, in same Vol., p. 424; EDITORIAL—*Calomel and tartar emetic as remedial agents*, The Chicago Med. Examiner, Vol. IV, 1863, p. 342; "A SURGEON"—*Calomel in the army*, Chicago Med. Jour., Vol. VI, 1863, p. 254; EDITORIAL—*Calomel and tartar emetic stricken from the supply table of the army*, Pacific Med. and Surg. Jour., Vol. VI, 1863, p. 237. I find also on the files of the Surgeon General's Office for 1863 a lengthy communication by Surgeon WM. LOMAX, 12th Indiana vols., dated June, 1863, in which the circular is severely criticised, and a letter, dated June 7, 1863, to the Secretary of War, from Governor DAVID TOD, of Ohio, who transmits "one of the many letters" he had received on the subject from Ohio physicians, and expresses the opinion that the Surgeon General's order "will prove most disastrous to the medical service, and should at once be revoked."

§ At this meeting, which was held May 30, 1863, Dr. L. M. LAWSON presided. Among the physicians who testified in the manner related in the text were Drs. D. C. MUSCROFT, G. C. BLACKMAN, MENDENHALL, JUDKINS, COMEGYS and SEXTON. An abstract of the proceedings and the text of the report will be found in the Cincinnati Med. and Surg. News, Vol. IV, 1863, p. 217. The report embraced the following forcible resolution: "Resolved, that the removal of W. A. Hammond from his position as Surgeon General would meet the approbation of the profession, be of advantage to our soldiers and creditable to the Government."

offered for the consideration of the association a series of resolutions in which the circular was condemned as "unwise and unnecessary," and the Surgeon General was requested to modify it. These resolutions were unanimously adopted.*

A few days after the announcement of this action Surgeon General Hammond sent out a printed letter requesting the opinions of "the more eminent members of the medical profession" on the subject, pointing out that various other mercurials were still on the supply table, and intimating that calomel itself could be obtained upon special requisition. A copy of this letter and an analysis of the replies on file in the Surgeon General's Office are subjoined in a foot note.† I also subjoin a foot note containing all the evidence I have

* See *Trans. of the Amer. Med. Ass.*, Vol. XIV, 1864, p. 23 *et seq.* The subject was introduced to the notice of the association by Dr. LAWSON of Ohio, who presided over the Cincinnati meeting, and he was appointed chairman of the committee. The other members were STILES of Vermont, DALTON of Massachusetts, CATLIN of Connecticut, BRINSMADE of New York, PIERSON of New Jersey, ASKEW of Delaware, WALLACE of Pennsylvania, HUPP of Virginia, WOODWORTH of Indiana, WING of Illinois, PALMER of Michigan, VAN DUZEN of Wisconsin, MCGUGIN of Iowa, MENDENHALL of Missouri, LOGAN of Kansas and BOWLING of Tennessee. The following are the resolutions adopted: "*Resolved*, 1. That this Association condemns, as unwise and unnecessary, the Circular of the Surgeon General, prohibiting the further supply of calomel and tartar emetic for use in the army, and that we regard such an order as an indignity to the military surgeons, while it is in direct opposition to the opinions of the regular profession of medicine. *Resolved*, 2. That the withholding ordinary medicines from the Army Surgeons implies a want of confidence in their skill as a body, which, if true, calls for the prompt interposition of the proper authorities; but if the imputation of a want of skill is unfounded, as we believe it is, the refusal to supply proper medicines is wholly unjustifiable. *Resolved*, 3. That Circular No. 6, being impolitic and prejudicial to the interests of the service, it is the decided sense of this Association, that a due regard for the welfare of the army requires, and we do therefore earnestly recommend, the revision of that circular and the substitution of the more just and philosophical method of correcting abuses, if any exist, by holding each surgeon individually responsible for the proper discharge of his appropriate duties." Of course certain irregular practitioners were jubilant over the order: I find on the letter files of the Surgeon General's Office for 1863 a letter, dated June 10, signed by PAUL W. ALLEN, president, and C. EDWIN MILES, recording secretary, of the Massachusetts Eclectic Medical Society, transmitting resolutions passed at the annual meeting of that society, June 3, 1863, in which the circular is warmly commended, and the society tenders its "heartfelt congratulations to Surgeon General Hammond for the liberal and independent position which he has assumed in this matter."

† The following is the text of this letter:

"SURGEON GENERAL'S OFFICE, *Washington City, D. C., June* 12, 1863.

"DEAR SIR: Desiring to obtain the opinions of the more eminent members of the Medical Profession relative to the indiscriminate use of Calomel and Tartarized Antimony, I have the honor to request that you will answer the following questions: 1st. To what extent do you prescribe Calomel and Tartar emetic in your practice? 2d. Do you regard these agents as indispensable in the treatment of disease? 3d. In view of the facts that a large number of the Medical Officers of the Army are young and inexperienced, and that soldiers cannot in the field be placed beyond the influence of atmospheric vicissitudes and exposure whilst undergoing medical treatment, would you recommend that the medicines in question be issued to Army Medical Officers, except, as at present, upon special requisition? 4th. Do you or do you not think that more harm than good has resulted from the use of Calomel and Tartar emetic as medicines? It should be stated that the following mercurials are at present on the Supply Table, viz: Hydrargyri chloridum corrosivum; hydrargyri iodidum flavum; hydrargyri oxidum rubrum; hydrargyri pilulæ; hydrargyri unguentum; hydrargyri nitratis unguentum; pilulæ cathartice compositæ; and that it is provided by paragraph 13, of Circular No. 7, dated Surgeon General's Office, May 7, 1863, which contains the Supply Table, and which refers to the manner of obtaining medical supplies, that 'it is not the design of the Department to confine Medical Officers absolutely to that table, either in variety or quantity, but only to establish a standard for their guidance in making requisitions for supplies, leaving individual preferences to be indulged at the discretion of the Medical Director or the Surgeon General. Neither is it supposed that the quantities of the table will always meet the necessities of unusual emergencies, as during epidemics, or in unhealthy seasons and localities; and Medical Officers who allow their supplies to be exhausted through any such contingencies, without timely notice of their approaching necessities, will be held to a strict accountability.'

I am, sir, very respectfully, your obedient servant, WILLIAM A. HAMMOND, *Surgeon General U. S. A.*

To Doctor —— ——."

This letter was reprinted in the American Medical Times, July 4, 1863, Vol. VII, p. 8. I find sixty replies on the files of the Surgeon General's Office, only two of them from civil practitioners. The following is a list of the writers:

1. Surg. J. F. HAMMOND, U. S. A., June 29;
2. Surg. WM. DICKINSON, U. S. V., July 1;
3. Asst. Surg. J. C. MCKEE, U. S. A., July 3;
4. Surg. S. D. FREEMAN, U. S. V., July 4;
5. Surg. J. H. BAXTER, U. S. V., July 4;
6. Surg. W. S. KING, U. S. A., July 6;
7. Surg. E. BENTLEY, U. S. V., July 6;
8. Surg. J. WILSON, U. S. V., July 8;
9. Asst. Surg. W. F. CORNICK, U. S. A., July 8;
10. Surg. H. CULBERTSON, U. S. V., July 9;
11. Surg. O. A. JUDSON, U. S. V., July 10;
12. Dr. J. J. REESE, Philadelphia, July 10;
13. Surg. W. H. WHITE, U. S. V., July 10;
14. Surg. J. G. HATCHITT, U. S. V., July 10;
15. Surg. A. CRISPELL, U. S. V., July 10;
16. Surg. C. S. TRIPLER, U. S. A., July 10;
17. Surg. J. J. B. WRIGHT, U. S. A., July 11;
18. Asst. Surg. J. TRENOR, U. S. V., July 11;
19. Surg. B. B. WILSON, U. S. V., July 12;
20. Surg. H. BUCKMASTER, U. S. V., July 12;
21. Surg. B. CLOAK, U. S. V., July 13;
22. Surg. J. H. GROVE, U. S. V., July 14;
23. Surg. S. D. TURNEY, U. S. V., July 15;
24. Surg. J. MOSES, U. S. V., July 16;
25. Surg. B. RANDALL, U. S. A., July 16;
26. Surg. G. R. WEEKS, U. S. V., July 17;
27. Surg. J. M. ROBINSON, U. S. V., July 17;
28. Dr. JOHN MCCALL, Utica, N. Y., July 18;
29. Surg. H. P. STEARNS, U. S. V., July 18;
30. Surg. J. D. BRUMLEY, U. S. V., July 18;
31. Surg. W. VARIAN, U. S. V., July 19;
32. Surg. J. G. F. HOLSTON, U. S. V., July 22;
33. Surg. S. N. SHERMAN, U. S. V., July 22;
34. Surg. D. W. BLISS, U. S. V., July 24;
35. Surg. J. W. FOYE, U. S. V., July 24;
36. Surg. T. M. GETTY, U. S. A., July 25;
37. Surg. W. HAYES, U. S. V., July 25;
38. Surg. H. WARDNER, U. S. V., July 25;
39. Surg. O. M. BRYAN, U. S. V., July 27;
40. Surg. A. L. COX, U. S. V., July 27;
41. Surg. P. A. O'CONNELL, U. S. V., July 27;
42. Surg. F. G. SNELLING, U. S. V., July 31;
43. Surg. J. OWEN, U. S. V., July 31;
44. Surg. J. E. QUIDOR, U. S. V., Aug. 1;
45. Surg. A. MAJER, U. S. V., Aug. 7;
46. Surg. T. W. FRY, U. S. V., Aug. 8;
47. Surg. A. R. EGBERT, U. S. V., Aug. 10;
48. Surg. R. K. SMITH, U. S. V., Aug. 11;
49. Surg. G. H. HUBBARD, U. S. V., Aug. 15;
50. Surg. C. N. CHAMBERLAIN, U. S. V., Aug. 16;
51. Surg. J. S. HILDRETH, U. S. V., Aug. 17;
52. Asst. Surg. B. HOWARD, U. S. A., Aug. 18;
53. Asst. Surg. C. WAGNER, U. S. A., Aug. 20;
54. Surg. C. C. DUMREICHER, U. S. V., Aug. 22;
55. Surg. M. GOLDSMITH, U. S. V., Aug. 28;
56. Surg. A. P. MEYLERT, U. S. V., Aug. 28;
57. Surg. J. R. LUDLOW, U. S. V., Oct. 29;
58. Med. Insp. PETER PINEO, U. S. A., July 14;
59. Med. Insp. F. H. HAMILTON, U. S. A., July 12;
60. Med. Insp. GEO. H. LYMAN, U. S. A., June 27.

In reply to the first question in the Surgeon General's letter, two writers only, Nos. 20 and 53, declared that they never employ either drug; and two, Nos. 7 and 8, stated that they did not employ either in military practice. On the other hand, six, viz: Nos. 9, 16, 17, 18, 19 and 24, boldly avowed and defended the use of both drugs in appropriate cases; thirteen, viz: Nos. 4, 5, 13, 14, 15, 29, 31, 32, 35, 38, 41, 47 and 52, approved of calomel in appropriate cases, but claimed to use it rarely and with great caution, while they either did not use tartar emetic, used it externally only, or passed it by in silence. The remaining writers, thirty-seven in number, admitted that they sometimes used both remedies, but either indicated a few conditions only, *e. g.*, yellow fever, syphilis, &c.,

been able to collect with regard to the abuse of calomel in the army prior to the issue of the circular of May 4th.*

This circular was never modified or revoked in orders, but it was suffered to become a dead letter, and I find no evidence that it exercised any perceptible effect upon the use of

as appropriate, or stated that they have rarely used these drugs of late years or have rarely done so in the military service. In reply to the second question, six writers, viz: Nos. 9, 16, 18, 21, 24 and 36, declared that they regarded both drugs as indispensable; nine, viz: Nos. 1, 2, 3, 38, 42, 47, 54, 57 and 61, stated that they did not hold them to be indispensable, thought that they are more useful than any other drugs under particular circumstances, six, viz: Nos. 11, 29, 30, 32 and 46, expressed a similar view for calomel only; and one, No. 2, for tartar emetic only; the remaining writers, thirty-eight in number, stated that in their opinion neither drug is indispensable. In reply to the third question, thirteen writers, viz: Nos. 1, 9, 13, 16, 17, 18, 19, 24, 30, 32, 45, 58 and 64, objected more or less decidedly to the limitations imposed; four, viz: Nos. 15, 20, 28 and 34, thought it would be just as well if neither drug was issued to the army at all; two, Nos. 24 and 59, expressed no opinion; while the remainder, forty-one in number, believed it would answer every purpose if these drugs could be obtained on "special requisition." In reply to the fourth question, four writers only, Nos. 1, 16, 17 and 24, boldly declared their belief that these drugs have done more good than harm; ten, viz: Nos. 2, 12, 14, 18, 19, 24, 36, 46, 47 and 60, contented themselves with denying the truth of the opposite proposition; ten, viz: Nos. 10, 11, 13, 15, 22, 26, 35, 39, 43 and 44, thought them calculated to do more harm than good in the army; two, viz: Nos. 55 and 56, thought they had done more harm than good in the southwest of the United States; seven, viz: Nos. 20, 50, 52, 57, 42 and 51 spoke in a general way of the injury resulting from their indiscriminate or injudicious use; fifteen, viz: Nos. 4, 5, 7, 8, 23, 25, 27, 28, 33, 41, 48, 49, 52, 54 and 58, flatly expressed the opinion that they have done more harm than good; one, No. 31, expressed the same opinion for tartar emetic only; the remaining writers, eleven in number, gave non-committal replies.

* This evidence certainly shows that mercurials were abused in certain quarters, but there is by no means so much of it as seems to be implied by the unlucky circular of May 4th. There are in the first place two pretty strongly worded reports on the official files, one by a medical inspector on a sanitary report, both of which, so far as they relate to this matter, are printed in full in Section II. The first is by Medical Inspector E. P. VOLLUM, dated April 23, 1863—see p. 94, *supra*—who reports that the surgeons in charge of the hospital transports and floating hospitals "complain of the number of cases of salivation" sent them from the regimental hospitals; and adds that he himself "saw two cases of mortification of the cheek from mercurialization. In both, one side of the head was greatly swollen, and a circular black surface about three inches in diameter occupied the central part of the cheek. Copious discharges of the foul secretions from the mouth rendered approach to the patients sickening." The second is a sanitary report by Surgeon A. H. HOFF, U. S. Vols., (afterwards assistant surgeon U. S. Army,) dated September 30, 1862—see p. 91, *supra*. Surgeon HOFF was in charge of the hospital steamer D. A. January, and states that most of the men placed on that boat for transportation "have been subjected to treatment and show evidences of its effects." Speaking of the cases of "intermittent and remittent fever complicated with diarrhœa," transported in the last two trips of the boat, he affirms "very many of these men, as high as fifty per cent., are salivated, yet the fever still persists." These two reporters were both competent observers and gentlemen of undoubted integrity, so that there can be no doubt that the facts they report actually existed at the times and places stated. Surgeon HOFF was one of the surgeons alluded to in Medical Inspector VOLLUM's report, for, in reply to an inquiry of the Surgeon General, the latter wrote, June 11, 1863: "As I reported before, I saw on board the hospital boats of the Mississippi two cases of mortification of the cheek produced by mercurialization, said to have come from regimental hospitals, and Surgeon Hoff in charge of the 'D. A. January,' and Surgeon Strawbridge, in charge of the 'Vicksburg,' complained to me of the number of cases of salivation that came from the same source." In addition to the two cases of mercurial gangrene observed by Medical Inspector VOLLUM, a third case, terminating in the separation, by necrosis, of the whole right superior maxillary bone, had previously been reported to the Surgeon General's Office, where the specimen was sent, for the Army Medical Museum, some time before the close of 1862. [It appears in the Catalogue of the Army Medical Museum, Surgeon General's Office, January 1, 1863, p. 35, as "No. 557. Right superior maxillary bone, separated spontaneously; gangrene of face following salivation."] The name of this patient, private Carlton Bergan, Co. B, Purnell Legion, appears on the register of the general hospital at Frederick, Maryland, as "admitted July 4, 1862," diagnosis, "typhoid pneumonia." The case-book of this hospital, kept under the direction of Assistant Surgeon R. P. WEIR, U. S. Army, surgeon in charge, reports that this man, 20 years of age, was "taken sick June 5, 1862, from exposure to wet, and suffered from cold and rheumatic pains. He continued ill, though not so as to keep his bed all the time till July 4, 1862, when he was sent to hospital (one of the detached buildings in Frederick) sick with typhoid fever. Aug. 3 was brought to this general hospital sick with fever." A special report of the case, received at the Surgeon General's Office states that he was "admitted general hospital, Frederick, Md., August 4, 1862;" and this is the date given in the printed reports of the case, to which I shall presently refer. To understand this apparent discrepancy in the date of admission, it must be stated that at the period named the general hospital at Frederick embraced, besides the principal hospital in the old stone barracks, four temporary hospitals in detached private buildings scattered through the town. All were, however, under a single administration, and accordingly when Bergan was taken, as Dr. WEIR states, to one of these detached buildings his name was entered on the register of the general hospital. What the case-book and special report give as the date of his transfer to the general hospital, Aug. 3d or 4th, was simply the date at which he was transferred from the detached building to the old stone barracks. The case-book cited above states that the reporter "learned from ——— surgeon, under whose care he was, previous to entering my ward, that he had salivated himself but not profusely a fortnight before his removal, for a tenderness in right side. He had subsequently administered chlorate of potass for six days; also that it had been ascertained that the quantity of mercury the patient took before entering this hospital [*i. e.*, this ward of the hospital.—Ed.] was 65 grs. of pil. hydrarg., 40 grs. of hydrarg. chlor. mit., and 20 grs. hydrarg. c. creta." Acting Assistant Surgeon J. H. BARTHOLF (now Assist. Surg., U. S. A.) states, in the special report referred to above, that "prior to admission at this hospital [*i. e.*, this ward.—Ed.] patient had taken for treatment of pneumonia a large quantity of mercury. As afterwards ascertained he took 65 grs. pil. hydrarg., 40 grs. hydrarg. chlor. mit. and 20 grs. hydrarg. c. creta." I have taken the trouble to present the foregoing evidence that this dosing occurred in a detached ward under the same administrative control as the rest of the general hospital at Frederick, because this circumstance made it possible for Drs. WEIR and BARTHOLF to ascertain with precision just what this man did take, and there can therefore no doubt that their statements are accurate. The details of the progress of the case after August 10, the separation of the necrosed maxillary bone, October 1st, the discharge of the patient from the service, December 23d, and the subsequent successful plastic operations performed upon him in the New York hospital by Dr. GURDON BUCK have been related in full by that gentleman—*Trans. of the Med. Soc. of the State of New York for the year 1863*, p. 173—and by my colleague, Assistant Surgeon G. A. OTIS, in the First Surgical Volume of this Work, p. 375; it is therefore unnecessary to do more than refer to them in this place. The foregoing constitutes all the testimony with regard to the occurrence in the army of salivation or mercurial gangrene received at the Surgeon General's Office prior to May 4, 1863, which I have been able to find. The following testimony for the most part referring to this period, was received subsequently: Surgeon J. H. GROVE, U. S. Vols., in charge of the Jefferson Barracks general hospital, St. Louis, Missouri, writes, July 14, 1863, in his reply to the Surgeon General's circular letter of June 12: "During last fall and winter I received into a large number of patients into this hospital who were ptyalised, and for which there evidently was no necessity, their systems generally being chronic diarrhœa and some cases of phthisis pulmonalis." Medical Inspector PETER PINEO, U. S. A., in his reply to the same circular, writes, from New Orleans, July 14, 1863: "During my nearly two years experience in active service I have seen much harm arising from the indiscriminate use of these articles, i. e., calomel and tartar emetic. I have, however, in this Department [*i. e.*, the Department of the Gulf.—Ed.] than in others where I have been," and he adds: "In examining the prescriptions of the surgeons in the different hospitals here, I find as a general rule very little of either of these two medicines exerted. Mass. hydrargyri is more commonly prescribed, and that not continuously but occasionally as a cholagogue cathartic." Finally I find a report by Acting Assistant Surgeon S. W. THOMPSON, in charge of hospital No. 2, Evansville, Indiana, to Surgeon WM. H. CHURCH, U. S. Vols., Medical Director Department of the Ohio, and forwarded by the latter to the Surgeon General, July 15, 1863. In this report, which is dated July 1, it is stated that "Private Ptolemy Higgins, Co. A, 91 Regt. Ind. Vols., was admitted into this hospital July 7, 1863, laboring under severe ulceration of the gums, the result of the administration of

mercurials, whether in the fluxes or other diseases, during the war.* So far as the fluxes are concerned, many medical officers treated them with purgative doses of calomel or blue pill, or employed alterative doses of these or mercury with chalk, until the close of the war; and although many avoided mercurials altogether, or at least avoided them in the chronic fluxes, this was true also before the issue of the circular as well as afterwards.† I know of no method of ascertaining the extent to which either mode of practice prevailed, or of determining statistically their comparative results.

Conversation with American practitioners inclines me to believe that the influence of the English example has, during the last few years, greatly diminished the use of these drugs in the treatment of fluxes in the United States; yet it must be admitted that calomel is still commended in the "sthenic" type of acute dysentery by at least one prominent American teacher.‡ For myself, I have long since ceased to employ any preparation of mercury in the treatment of any form of flux, and my study of the literature of the subject inclines me to believe that no advantages are to be expected from them that can counterbalance the serious objections to their use, especially in military practice. Their employment would be theoretically justifiable only, if it were true, as has been so often asserted, that they increase the diminished hepatic secretion, or that they modify favorably the condition of the intestinal mucous membrane. So far as the first assumption is concerned, it has already been shown in sufficient detail that it is positively contradicted by experiment.§ As to the second suggestion, it is known that calomel undergoes, under different circumstances, various chemical decompositions in the alimentary canal,‖ some of

mercurials. This man had had erysipelas very badly, and to render his condition worse than it otherwise would have been, the severe ptyalism to which I refer existed. This is not an isolated case in this regiment. Just before the receipt of your circular I had two companies of this regiment under my charge, as acting assistant surgeon. There were at least a dozen cases of severe ptyalism amongst them, all being contracted at Smithland, Kty., in hospital under charge of the regimental medical officers. This I obtained from both privates as well as officers of the companies. Some of these cases were very aggravated, there being deep ulcers in the cheeks, tongue, &c., and excessive swelling and inflammation of all the salivary glands." As to the occasional occurrence of salivation in the Cincinnati hospitals, we have the testimony of the report cited in note §, p. 719, *supra*, which states: "The medical profession here have had an opportunity to observe in the military hospitals of this city and vicinity, the condition of about twenty-five thousand cases of sick and wounded soldiers, and a careful examination of the records shows that no more than nine cases of ordinary salivation have existed; and not one case of mercurial gangrene has been seen." This statement may be accepted as conclusive as to the existence in the Cincinnati hospitals of at least nine cases of mercurial salivation. It does not prove that there were no more. Those who are familiar with the manner in which hospital records were kept during the war will know how impossible it would be to ascertain the number of cases of salivation which may have occurred in any hospital during a given period of time by the records; and an examination of the records of the Cincinnati hospitals, now filed in the Surgeon General's Office, shows that they offer no data for such a research. In such an inquiry the recollection of the medical officers on duty would furnish the only information.

* According to the Editor of the Medical and Surgical Reporter, Sept. 12, 1863, Vol. X, p. 275, a "correspondent, holding a high position in one of our grand armies," wrote to that journal: "For my own part, despite the order, I get plenty of calomel, and use it without hesitancy." The statement compiled by Surgeon W. C. SPENCER, U. S. A., (see p. 708, *supra*,) shows that the quantity of calomel actually purchased for the army during the war was 166,016 ounces, avoirdupois, besides 683,131 dozen of the compound cathartic pills of the U. S. Pharmacopœia, each of which contained a grain of calomel. According to information furnished by my colleague, Surgeon J. S. BILLINGS, U. S. A., 25,847 ounces of calomel and 194,684 dozen compound cathartic pills remained unissued in the purveying depots Dec. 31, 1865. The total quantity issued was therefore 140,169 ounces of calomel and 488,447 dozen compound cathartic pills. This quantity is altogether the equivalent by weight of more than three and a half millions of scruple doses of calomel issued. It is, of course, impossible to ascertain how much of this was actually swallowed by the sick, but as so much was available for use, it cannot certainly be held that the supply was at all a meagre one.

† Thus, Surgeon POTTER of the 30th Ohio vols.—p. 83, *supra*—reports March 31, 1862, that in the diarrhœa of that regiment he found mercurials "almost universally injurious." Acting Assistant Surgeon DEBRULER—p. 42, *supra*—writes from hospital No. 2, Evansville, Indiana, August 30, 1862, that in the treatment of chronic fluxes in that hospital "mercurials, opiates and the ordinary astringents have been worse than useless;" and a number of the earlier reporters in Section II, in describing the treatment they found best for camp fluxes, do not even allude to mercurials.

‡ H. C. WOOD—p. 436, *op. cit.*, p. 675, *supra*—declares: "In dysentery of an acute sthenic type, calomel has yielded, in my hands, better results than any other remedy. It probably acts as an antiphlogistic and as an alterative, not only to the liver, but to all the intestinal glands." In this connection I may mention also the paper of J. F. KENNEDY—*On the use of calomel in large doses in the treatment of dysentery and diarrhœa*, Med. and Surg. Reporter, Vol. XXIII, 1870, p. 467—who reports three cases of acute dysentery in adults successfully treated with doses of a scruple or more of calomel at bedtime, and two of acute diarrhœa in children treated with equal success with proportionately large doses. The author naïvely remarks: "The remedy is not a new one, nor the dose," and a letter from J. S. SUESSEROTT—Philadelphia Med. Times, Vol. VIII, 1878, p. 115—who reports the successful treatment of two cases of chronic flux by a purge of calomel, aloes and rhubarb, followed by laudanum in ten-drop doses every hour.

§ See pp. 275 to 277, *supra*, especially the notes, for an account of the experiments on this subject. Since those pages were printed RUTHERFORD and VIGNAL have published a *Third series* of their *experiments on the biliary secretion of the dog*—The Journal of Anatomy and Physiology, Vol. XI, 1877, p. 654 *et seq.*—in which a further examination of the question only served to confirm their previous conclusion that calomel does not increase the biliary secretion. On the other hand, this effect was produced in a decided manner by small doses of corrosive sublimate—see p. 734, *infra*.

‖ On the subject of the various chemical changes which calomel undergoes under different circumstances, see, especially, R. BELLINI—*Contributo alla storia terapeutica del calomelano o proto-cloruro di mercurio*, Lo Sperimentale, T. XXXI, 1873, p. 634. A brief abstract of the more important conclusions arrived at by this experimenter will be found in STONE'S *Half-yearly Abstract of the Medical Sciences*, Vol. LVIII, 1873, p. 130; also in the monograph of H. HALLOPEAU—*Du Mercure*, Paris, 1878, p. 53 *et seq.*

the products of which are highly irritating to the intestinal mucous membrane, and that it appears to owe its power of purgation to the irritation thus produced.* The same is probably true of the mercury in blue pill, and the oxide it contains when administered is directly irritating. It has not been proven that this intestinal irritation is beneficial in its effects, and the variable character and extent of the chemical changes that occur with a given dose of these purgatives in different individuals render their effect uncertain. A quantity which may be safely taken by some patients will in others produce serious local disturbances: worst of all, unexpected salivation is occasionally produced even after comparatively small doses.† Against these objections no convincing evidence, that the use of mercurial purgatives in the treatment of the fluxes is followed by better results than may be obtained by less dangerous drugs, has as yet been brought forward. On the contrary, we have seen that it is claimed by the English physicians in India that since they have substituted ipecacuanha in the treatment of dysentery the percentage of mortality from that disease has greatly diminished.‡

There are yet graver objections to the administration of repeated small doses of mercurials to dysenteries with a view to their alterative or supposed antiphlogistic effects. Aside from the dangers of salivation and other forms of mercurial poisoning, the debilitating effect of this mode of treatment constitutes a serious objection in morbid conditions in which the tendency to debility is already great; and the fact that an acute intestinal catarrh is one of the most frequent accidents of the constitutional impression of mercury, however produced, would seem to contraindicate the employment of this measure in cases in which the intestinal canal is already inflamed.§ Nothing, then, could justify a resort to the constitutional impression of mercury in the management of the fluxes but the certainty that it exercised a beneficial effect upon the progress of the local morbid process. Loud assertions to this effect have been made, as we have already seen, but the evidence brought forward to support them is anything but conclusive. The numerous instances reported, in which dysenteric patients thus treated have recovered, prove only that many individuals are capable of surviving the treatment as well as the disease. There is no proof whatever that the percentage of recoveries is greater among those mercurialized than among those treated in other ways; indeed, the general tenor of the evidence is in the opposite direction.

These objections to the use of mercurials in the treatment of the fluxes apply to cases occurring in civil life as well as to army practice; but in the latter an additional objection is to be found in the wide-spread tendency to a scorbutic condition which has always arisen in every great army that ever kept the field for any length of time in any war. Since Kramer reported the fatal results of the attempt to cure scurvy by salivation in the camp of the imperial army at Semendria in the year 1718,‖ observations of the disastrous effects of the mercurial impression, when ventured upon in scorbutic subjects, have multiplied,

* See on this subject HALLOPEAU—*op. cit.*, p. 71.

† Even mercurial gangrene has been known to occur after the exhibition of comparatively small purgative doses of calomel. An extreme instance of this accident is reported by A. CAMPBELL—*Fatal effects of calomel*, The India Jour. of Med. Sci., Vol. I, 1831, p. 74. The patient, a boy 14 years old, suffering with malarial fever, took a purgative dose of three grains of calomel and eight of colocynth, followed next morning by a drachm of compound powder of jalap. This operated freely, and was repeated with the same result two days afterwards. Two days later the mouth began to swell, and mercurial fetor, ulceration and gangrene of the gums, palate and lips followed, from which the patient died fifteen days after the first dose.

‡ See note *, p. 698, *supra*. § See HALLOPEAU—*op. cit.*, p. 101.

‖ J. G. H. KRAMER—*Disp. epistolica de scorbuto*, Nuremberg, 1737, in Haller's Disp. ad Morb. Hist. et Cur. fac., T. VI, Lausanne 1778, p. 135—relates that in 1718 salivation having been resorted to in the treatment of scurvy then prevailing in the imperial camp at Semendria, (in Servia near Belgrade,) four hundred of the patients thus treated died. An abstract of this dissertation will be found in the treatise of LIND—*On the Scurvy*, 2d Ed., London, 1757, p. 403. R. KREBEL—*Der Scorbut*, Leipsic, 1866, S. 13—states this event occurred in 1720, but KRAMER, writing h[illegible] *militiam attinens* in 1720, says it happened two years before: "Quod etiam fatalis eventus approbavit, ubi Semendriæ dictæ ante biennium [illegible] scorbutici ex gregariis Cæsareanis in salivatione periere."

and it has long been admitted, even by ardent advocates of the use of mercurials in dysentery, that their employment in this disease is contraindicated by the coexistence of a scorbutic taint.* The same considerations of course apply to diarrhœa, or indeed to any other disorders complicated by scorbutic conditions.

Before leaving the subject of the use of mercurials in the fluxes, I must refer to the suggestion that minute doses of *corrosive sublimate* might advantageously be resorted to for the purpose of obtaining, in the most certain and least dangerous manner, the supposed benefits of the alterative effects of mercury. This method, recommended in 1827 by Kopp, who had previously employed corrosive-sublimate injections in dysentery with apparent advantage,† has since been warmly approved by several writers, especially by Eisenmann.‡ Parkes claimed to have given with advantage as much as one-eighth to one-sixth of a grain at a dose in certain cases of chronic dysentery.§ Quite recently Ringer has revived the method of Kopp, and states that the hundredth of a grain of corrosive sublimate, given every hour or every two hours according to the severity of the case, whether in acute or chronic dysentery provided the stools are slimy or bloody, rarely fails to free them from blood and slime and to relieve the disease.‖ The experiments of Rutherford and Vignal show that corrosive sublimate, in comparatively small doses, increases the hepatic secretion of the dog;¶ and it is exceedingly probable that it acts in the same way on man. It is possible that this property, as well as its alterative effects, may prove beneficial in the treatment of the fluxes, and certainly it offers a convenient mode of giving a mercurial in definite minute doses, and thus avoiding the depressing influence which, as ordinarily administered, mercurials are so apt to exert.** The evidence is, however, as yet insufficient to enable us to arrive at a just estimate of the value of this mode of treatment.

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* Without attempting to collect the testimony to this effect, I may refer to the experience of ANNESLEY, who found—Vol. II, p. 391, *op. cit.*, p. 621, *supra*—that in scorbutic dysentery "calomel, particularly when given in full doses, readily affects the mouth and salivary apparatus, without being followed by any beneficial effect upon the disease, but, on the contrary, often aggravating it, and increasing the debility of the patient." This experience is corroborated by the observations of PARKES—p. 143, *op. cit.*, p. 682, *supra*. MARTIN—p. 458, *op. cit.*, p. 621, *supra*—goes still further, remarking, "nor should mercury in any shape be used in adynamic forms of the disease, in the splenic cachexia, nor in states of anæmia—for in all these conditions of the system its actions are most injurious."

† J. H. KOPP—*Merkur bei Ruhren und Durchfällen*, Hufeland's Journal, Bd. LXIV, 1827, St. 4, S. 92—used the sublimate in very small doses. He added ½ to ¾ of a grain of corrosive sublimate and 12 to 18 drops of Sydenham's laudanum to seven ounces of gum water: dose, a tablespoonful every hour. The corrosive-sublimate clysters are described in his *Beob. im Gebiete der ausübenden Heilkunde*, Frankfort, 1821, S. 128. The formula was ⅛ to ¼ of a grain of sublimate and a grain of opium to two ounces and a half of gum water: a wineglassful (ein Glas voll) to be injected warm. In the subsequent paper, cited above, he remarks that often the quantity of sublimate contained in the clyster should not exceed $\frac{1}{16}$ to $\frac{1}{12}$ of a grain.

‡ EISENMANN—*Die Krankheits-Familie Typhus*, Erlangen, 1835, S. 410—declared that corrosive sublimate was "ein vorzügliches Mittel" in dysentery. He regarded it as a disinfectant, and expressed the hope that it would drive calomel out of therapeutics: "Wir hoffen überhaupt, dass der als ein so intensives Desinfektionsmittel vielfältig erprobte Sublimat, das zweideutige Calomel, das bey den grossen Dosen, in welchen es oft gegeben werden muss, gar zu leicht nachtheilig würkt, aus der Therapie der fieberhaften Krankheiten allmälig verdrängt werde." BAMBERGER—S. 417, *op. cit.*, p. 578, *supra*—in mentioning these suggestions, seems to regard the clysters at least worthy further trial.

§ PARKES—p. 151, *op. cit.*, p. 682, *supra*—recommended this treatment in the form of chronic dysentery "following colonitis or erythematous dysentery." He remarks: "The preparation I have found most useful is the bichloride of mercury, commencing with doses of one-eighth to one-sixth of a grain in combination with the preparations of cinchona. I know that this combination has been called unchemical, but it certainly loses no part of its activity by the changes that occur: nor is there any insoluble salt of mercury formed."

‖ S. RINGER—*A Handbook of Therapeutics*, 4th Ed., Amer. reprint, New York, 1875, p. 223—also commends minute doses of corrosive sublimate in several forms of the diarrhœa of children: "A single grain of bichloride dissolved in half a pint of water, and a teaspoonful of this given each hour," p. 222. I note that R. RAVENBURG—*Acute intestinal catarrh of infants, and its treatment by mercuric chloride, (corrosive sublimate,)* The Medical Record, Vol. XIV, 1878, p. 4—recommends a similar treatment, and explains its alleged efficacy by the supposition that the sublimate acts as a parasiticide, destroying the micro-entozoa imagined by him to cause the disease. He writes: "I prescribe one grain of the mercuric chloride to twelve ounces of distilled water. One teaspoonful to be mixed with an ordinary teacupful of milk, previously subjected to at least 150° F. for five minutes; the milk should never be brought to the boiling point. Of the milk so prepared I give to the infants as much at a time as age and the condition of the patient may demand." C. H. HALL—*Corrosive sublimate in intestinal catarrh*, same Vol., p. 194—has since reported the successful treatment of three cases by this method.

¶ RUTHERFORD and VIGNAL—*loc. cit.*, note §, p. 722, *supra*.

** In this connection I may refer to the essays of WILBOUCHEWITCH—*De l'influence des préparations mercurielles sur la richesse du sang en globules rouges et en globules blancs*, Archives de Physiologie, 2me Série, T. I, 1874, p. 509; and E. L. KEYES—*The effect of small doses of mercury in modifying the number of the red blood corpuscles in syphilis; a study of blood-counting with the hématimètre*, The Amer. Jour. of the Med. Sci., Vol. LXXI, N. S., 1876, p. 17. The patients observed by WILBOUCHEWITCH were syphilitics treated in hospital, who took daily 4 centigrammes of corrosive sublimate or 10 centigrammes of the protiodide of mercury. The effect was at first an increase in the number of red blood corpuscles and diminution in that of the white corpuscles, but the long-continued use of these doses produced a diminution in the number of red globules also. KEYES attributes the latter result partly to the depressing effects of hospital life, partly to the dose of mercurial being too large. He himself concludes that "mercury in small doses continued for a short or for a long period in syphilis, alone or with the iodide of potassium, increases the number of red corpuscles in the blood,

It remains to offer a few *concluding remarks on the use of purgatives* in the fluxes. The history of those discussed will serve to indicate the general favor with which remedies of this class have been regarded from the earliest times; but their use in the treatment of dysentery has not been universally accepted. The disapproval of Galen and the caution of Avicenna have already been referred to.* During the sixteenth century several physicians, prominent among whom were L. Fuchsius and Alexander Massaria, strongly protested against them. The latter of these writers clearly formulated the apprehension that they would act as additional irritants to the already inflamed intestinal mucous membrane. These objections, to which Sennertus offered a well considered reply,† had long been forgotten, when they were revived in a slightly modified form by the teachings of Broussais.‡ Such was his influence for a time that when Roche, in 1830, declared both emetics and purgatives to be dangerous in acute colitis, he assured his readers that he was but expressing the opinion of the great majority of the practitioners of the day.§ Yet the success of Bretonneau and Trousseau‖ with saline cathartics had already shown that these supposed dangers were greatly exaggerated, and the doctrines of the physiological school gradually lost credit even in France. It may be admitted that a free resort to drastic cathartics would be likely to prove hurtful to the inflamed intestines, and ought to be avoided, a caution which has been repeated by prudent physicians from the earliest times;¶ but the temporary irritation of the intestinal mucous membrane produced by properly selected salines and other mild cathartics is of a trifling character and does not interfere with the benefits resulting from their action.**

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and maintains a high standard of the same." The observations brought forward to support this conclusion were made upon patients who took daily from three to eight granules containing $\frac{1}{8}$ of a grain of protiodide of mercury, or who took three times a day with various quantities of iodide of potassium, $\frac{1}{4}$ to $\frac{1}{12}$ of a grain of biniodide of mercury, or $\frac{1}{24}$ to $\frac{1}{48}$ of corrosive sublimate. He further concludes that "mercury in small doses is a tonic (for a time at least) to individuals in fair health, not syphilitic. In such individuals, it increases the number of the red blood corpuscles." This conclusion is based upon the results of an experiment upon himself: He took $\frac{1}{8}$ of a grain of protiodide of mercury three times daily for two weeks. At the beginning of the experiment his blood counted 4,775,275 globules per cubic millimetre, at the close 5,562,062 globules.

* See pp. 703–4, *supra*.

† L. FUCHSIUS—*Paradoxorum Medicinæ Libri tres*, &c., Basel, 1535, Lib. II. Cap. 13, fol. 81. In this chapter, which is headed "Omnium exitiosissimum esse, veterumque placitis maxime adversum, dysenteria affectos purgantibus exarmitieari medicamentis," the author supports his views by texts from GALEN, ALEXANDER OF TRALLES, CELSUS and AVICENNA. He argued especially, and in this was doubtless correct, that the rhubarb of DIOSCORIDES and other ancient writers was the astringent and not the purgative variety. According to SENNERTUS—*loc. c.t., infra*—FUCHSIUS maintained similar views in his treatise *De Comp. Med.*, Lib. I, Cap. 84, which I have not been able to see; nor have I been able to examine for myself the opinions of ALEXANDER MASSARIA, of whose works we have only, in our library, his treatise *De Peste*, Venice, 1579. SENNERTUS states—*l.c. cit.*—that he objected at great length to the use of purgatives in dysentery, relying especially on the doctrine of GALEN, that in treating disease the peccant humor should not be attracted to the affected part nor evacuated through it. He reasoned, says SENNERTUS, as follows: "Cum ergo in dysenteria intestina cum fluxione, tum ulcere, sæpe etiam inflammatione laborent, non licere putat, purgantia exhibere, quæ fluentes humores ad illa magis attrahant, dolorem que ulceris et alia symptomata augeant." SENNERTUS—*Quæstio IV*, cited note *, p. 705, *supra*—in reply endeavored to show that these objectors misunderstood the teachings of the ancients, pointed out that even GALEN, in common with other Greek physicians, used abstergents in dysentery, among other articles, for example, milk, and argued, in reply to the objections of MASSARIA, that it was better for the patient the physician should evacuate the vicious humors from the intestines at once, in a few copious stools, than leave them to the efforts of nature, which will usually require many protracted and painful efforts to effect the same end; for during this delay the morbid juices will surely exert a more injurious influence upon the intestines than properly selected purgatives could possibly do.

‡ BROUSSAIS—T. III, p. 208 *et seq.*, *op. cit.*, p. 643, *supra*—taught that two indications sufficed for the treatment of dysentery: "1°. d'purger à la membrane phlogosée la présence des corps étrangers qui pourraient augmenter son irritation; 2°. de lui faire parvenir ceux qui jouissent d'une propriété opposée." It might be thought that purgatives would play a prominent role under the first of these indications, but this is not so. The author insists on abstinence from stimulating drinks and food that can leave an excrementitial residue in the intestines, appearing to regard the bowels as quite able in most cases to disembarrass themselves of any noxious matters they may contain at the beginning of the disease, without the assistance of art. Only when there is depression of the vital powers does he advise emetics or purgatives. "afin de solliciter les fibres musculaires des voies gastriques, qui sont déjà dans la stupeur, à se débarrasser des matières putrides provenant, soit des alimens, soit des excrétions bilieuses, muqueuses, etc." p. 211. But even this limited use of purgatives appears to have been neglected by his followers. A. FOUQUET—*De la Dysenterie*, Vannes, 1852, p. 16—writes: "L'école physiologique repousse les purgatifs du traitement de la dysenterie, parce que ce sont des agents constamment irritants et perturbateurs." The views of ROCHE—cited next note—may be taken as a fair representation of the opinions of that school on this matter.

§ L. CH. ROCHE—Art. *Colite*, Dict. de Med. et de Chir. Pratiques, T. V, Paris, 1830, p. 354—advised that neither emetics nor purgatives should ever be used in dysentery: "Quoi qu'il en soit, il est bien démontré aujourd'hui, ce me semble, que les vomitifs et les purgatifs sont en général plus nuisibles qu'utiles dans la colite aiguë, et que, faute de signes propres à nous faire distinguer à l'avance les cas dans lesquels ils peuvent nuire de ceux dans lesquels ils peuvent produire de bons effets, le parti le plus sage est de s'en abstenir dans le traitement de cette maladie. On serait d'autant plus coupable d'en agir autrement, qu'il est toujours possible de les remplacer par des moyens plus certains et qui ne font pas courir les mêmes chances aux malades."

‖ See p. 707, *supra*. ¶ See p. 701, *supra*.

** In a former publication—WOODWARD, p. 228, *op. cit.*, p. 606, *supra*—I expressed the opinion that when in acute dysentery "the bowels are once thoroughly cleansed, purgatives are no longer admissible, they do not modify favorably the progress of the disease, and increase the prostration which usually exists." I have long since abandoned this view, as I have the preference for castor oil, expressed in the same paragraph.

In the present state of our knowledge, purgatives may reasonably be administered to patients laboring under the fluxes, with three distinct objects: (a) To evacuate noxious matters contained in the alimentary canal; (b) to increase or modify the secretion of the intestinal mucous membrane; and (c) to increase the biliary secretion in acholic conditions. (a) With regard to the first of these indications there can be no material difference of opinion. All the fluxes are characterized by disturbances of the digestive functions, in consequence of which more or less decidedly fermentative or even putrefactive processes go on in the intestinal contents. Not merely are the products of these changes a source of irritation at the commencement of acute attacks, when a good deal of undigested food is often contained in the alimentary canal, but during the subsequent stages of the disease, although the quantity of the intestinal contents is usually smaller, the abnormal character of the chemical changes is often more marked and their products more irritating, especially when ammoniacal compounds are set free. Any efficient purgative that is not itself capable of producing serious intestinal disturbance would answer to evacuate these abnormal products, and were this the only indication to be fulfilled, the taste of the patient and the mildness yet thoroughness of the action of the drug would be all that need be considered in making a choice.

(b) As to the possibility of fulfilling the second indication some difference of opinion has of late arisen. The experiments of Thiry, repeated by Schiff and Radziejewski, together with the more elaborate investigations of the latter,* seemed to show that the general belief in an increase of the intestinal secretion resulting from the action of purgatives was quite unfounded, and that their powers were limited to a mere increase of the peristaltic motions of the intestines. But the subsequent investigations of Moreau indicated that these researches cannot be regarded as conclusive, and that sulphate of magnesia at least actually does increase the intestinal secretion. Moreau's experiments were repeated with similar results by Vulpian and Lauder Brunton;† the former also obtained like effects with resin of jalap,

* L. THIRY—*Über eine neue Methode den Dünndarm zu isoliren*, Sitzungsberichte der Mathematisch-Naturwiss. Classe der kais. Akad. der Wiss., Bd. L, 1864, S. 19—performed his experiments as follows: He divided the ileum or jejunum of dogs in two places, and sewed together the divided extremities of the intestine so as to restore the continuity of the canal. One end of the isolated piece, which still remained attached to the mesentery, was sewed up, the other end was attached to the edges of the abdominal wound, where it remained open, forming a short *cul-de-sac*. If the animal did not speedily die of inflammation, it usually began to eat again on the third or fourth day, and by the fourteenth the wounds were sufficiently healed to permit it to be used for experiment. Now THIRY found that when he purged a dog, thus prepared, by senna or sulphate of magnesia introduced into the stomach, or by croton oil rubbed upon the skin of the belly, no increase took place in the secretion of the *cul-de-sac;* nor was this effect produced when the two former drugs were introduced directly into the *cul-de-sac*. These experiments on dogs were repeated by SCHIFF—*Nuove ricerche sul potere digerente del succo enterico*, Il Morgagni, anno nono, 1867, p. 642—who introduced into his *cul-de-sacs*, in preparing which he took pains to make as little torsion as possible on the mesenteric vessels of the isolated part, aloes, jalap, sulphate of soda and calomel, and obtained either very slight increase of secretion or none at all. Similar were the results obtained by S. RADZIEJEWSKI—*Zur physiologischen Wirkung der Abführmittel*, Reichert u. Du Bois-Reymond's Archiv, Jahrg., 1870, S. 37—who repeated THIRY's experiment on a young bitch with croton oil and sulphate of magnesia. Moreover he analyzed chemically the normal fæces of dogs fed on flesh, and those produced by various purgatives, and concludes that nothing is found in the latter that cannot readily be explained on the theory of increased peristalsis, without invoking increased transudation or secretion to account for any of the ingredients. He proved by experiment that several purgative substances actually do increase the peristaltic motion of the intestine, and endeavored to show that the fluid stools cannot be explained by the observation of A. MOREAU—*De l'influence de la section des nerfs sur la production de liquides intestinaux*, Comptes Rendus, T. LXVI, 1868, p. 554—that the section of the nerves going to a loop of intestine is followed by an increased secretion from the mucous membrane.

† A. MOREAU—*Expériences sur l'intestin*, (read before the Acad. de Méd., July 5, 1870,) Gazette Méd. de Paris, T. XXV, 1870, p. 374—combated the conclusions of THIRY and RADZIEJEWSKI by experiments, in which he held that he more nearly approximated the normal conditions. Two ligatures were applied to the small intestine of a dog, 15 to 20 centimetres apart. Into the space between these ligatures he injected 20 cubic centimetres of water containing 4 grammes of sulphate of magnesia in solution. The intestine was then returned to the abdomen, the wound closed and the animal left in repose. This operation was performed on eight dogs, which were killed at various intervals from six to twenty-four hours afterwards, and in every instance a considerable accumulation of fluid, 50 to 335 cubic centimetres, was found between the ligatures. He also modified the experiment of THIRY by ligating both ends of the isolated loop of intestine and injecting into it immediately after the operation the same quantity of solution of sulphate of magnesia mentioned above, and found next day that the loop contained 90 cubic centimetres of liquid. In a subsequent paper—*Expériences sur l'intestin*, (suite,) read before the Acad. de Méd., Sept. 12, 1871, same Jour., T. XXVI, p. 415—MOREAU reports a still further investigation of THIRY's mode of experimentation, from which he is led to suggest several explanations of the negative results obtained by him and RADZIEJEWSKI: Either, 1, the purgatives introduced into the loop do not remain there long enough to produce their characteristic action, for which some time is required; or, 2, after recovery from the operation the interior extremity of the *cul-de-sac* is not closed and the fluid injected escapes into the peritoneal cavity; or, 3, the intestinal mucous membrane in the *cul-de-sac* may, in some cases after the operation, submit in its abnormal position to atrophic changes which render it incapable of responding to stimuli that would readily act on the normal mucous membrane. VULPIAN—Comptes Rendus, &c., de la Soc. de Biologie, Sér. V, T. V, 1874, p. 182, séance du 17 Mai, 1873—repeated the experiments of MOREAU in a modified manner on dogs poisoned with curara or morphia. He concludes that sulphate

the latter with croton oil, elaterin and gamboge. Yet more recently Brieger,* at the suggestion of Cohnheim, performed a series of experiments very similar to those of Lauder Brunton, but with a still greater number of substances. From these he concluded that laxatives, such as senna, rhubarb, castor oil and aloes, do not augment the intestinal secretion, and that their action must be explained by increased activity in the peristaltic movements; that the neutral salts certainly possess the power of producing a discharge of watery fluid from the intestinal mucous membrane mingled with increased secretion; and that drastics, such as croton oil and colocynth, when given in sufficient doses, not only produce a similar effect, but that the secretion is mingled with inflammatory products. It seems, therefore, to be pretty well established by experiment that the neutral salts produce a greater increase in the intestinal secretions, with less local irritation, than can be obtained with any other purgatives with which we are acquainted.

Vulpian has gone so far as to conclude, from the dissection of dogs to whom purgative doses of sulphate of magnesia and resin of jalap had been given, that these drugs occasion a genuine intestinal catarrh; and if this name is to be bestowed upon every condition in which there is increased vascularity of the intestinal mucous membrane accompanied by increased secretion, this conclusion must probably be regarded as correct. Certainly the suggestion of Liebig, that the saline cathartics occasion watery stools by merely determining free osmosis from the bloodvessels into the intestinal canal, a view which has long been rejected by thoughtful therapeutists, appears now more than ever untenable.† But many additional investigations will be required before we shall be in a position to determine with

of magnesia produces a genuine intestinal catarrh with increased transudation and without material increase in the activity of the peristaltic action. On the other hand, resin of jalap dissolved in dilute alcohol, while it produced a more intense catarrh, (not merely vascular congestion, but veritable ecchymosis being observed,) exaggerated the peristaltic movements. In discussing this paper LEGROS stated that he also, in connection with ONIMUS, had satisfied himself by experiment a few years before that saline purgatives do not increase the activity of the peristaltic movements. T. LAUDER BRUNTON—*On the action of purgative medicines*, The Practitioner, Vol. XII, 1874, p. 345 *et seq.*—experimented on cats by opening the abdomen, tying four ligatures around the small intestine a few inches apart from each other so as to isolate three short portions of the intestine; the purgative medicine is then injected into the central portion by means of a hypodermic syringe, the intestine returned to the abdomen and the wound sewed up. A few hours after, the animal being killed, the portion into which the purgative was injected was found full of liquid, while the two adjoining portions, ligated in the same manner remained empty. This result was obtained with the purgatives mentioned in the text. A similar experiment with jalapin produced negative results, but the author reports that he is uncertain in this case whether a sufficient quantity was actually introduced. I note in these experiments that, while croton oil inflamed the mucous membrane with which it was brought in contact, this was not the case with sulphate of magnesia, "not the slightest trace of congestion was noticeable."

* L. BRIEGER—*Zur physiologischen Wirkung der Abführmittel*, Archiv für Exp. Pathologie und Pharmakologie, Bd. VIII, 1878, S. 355—injected the purgative substances into the first and last loops of intestine, and left the central loop empty for comparison, but otherwise followed the method of BRUNTON; see last note. Five grammes of a half-per-cent. solution of sulphate of magnesia injected into the first loop, and the same quantity of a one-per-cent. solution injected into the last, were wholly reabsorbed without producing other effect. After injection of the same quantity of a twenty-per-cent solution the loops were always distended with a clear yellowish fluid, which possessed the power of transforming starch into grape sugar and of dissolving raw fibrin. Similar effects were produced by 4 grammes of a fifty-per-cent. solution, as well as by a saturated solution of Glauber's salt, and, though to a much less degree, with a saturated solution of common salt. The drastics experimented with were croton oil dissolved in ether or olive oil, and extract of colocynth dissolved in water; in these experiments the mucous membrane of the loop was inflamed, and many red and white blood corpuscles, as well as flocculi of fibrin, were found with the microscope, which was not the case with the salines. When such laxatives as infusion of senna, powdered rhubarb, aloes or its extract and castor oil were introduced, the intestinal loop was always found empty, firmly contracted, its mucous membrane not inflamed to the slightest degree, and the substance introduced was found still present, spread out over the mucous membrane of the loop. These experiments appear to have been made with great care, and the dogs were killed at various intervals, 4½, 5, 7 and 16 hours, after the introduction of the laxatives mentioned, but always with the same result. I must, therefore, confess some surprise at finding that BRIEGER reports similar results, to those obtained with the laxatives named, with calomel and gamboge, (gummi gutti,) both of which he classes as laxatives. The first, indeed, was given in a small dose, 25 centigrammes to a dog, so that the question of the action of a larger dose remains open; but it seems strange that the quantities of gamboge used, 2 and 3 grammes of a ten-per-cent. solution, produced no greater effect.

† This suggestion of LIEBIG, first thrown out in his *Unters. der Mineralquellen zu Soden und Bemerkungen über die Wirkung der Salze auf den Organismus*, Wiesbaden, 1839, S. 4 *et seq.*, is still more clearly formulated in his essay *Ueber die Constitution des Harns der Menschen und der fleischfressenden Thiere*, Annalen der Chemie und Pharmacie, Bd. L, 1844, S. 179, and his *Unters. über einige Ursachen der Säftebewegung im thierischen Organismus*, Braunschweig, 1848, S. 56. Against this view H. AUBERT—*Exper.—Unters. über die Frage, ob die Mittelsalze auf endosmotischem Wege abführen?* Zeitsch. für rat. Med., Jahrg., 1852, S. 225—brought forward a series of experiments which show—S. 239—that a given purgative dose of sulphate of magnesia, or other purging salt, produces the same effect whether dissolved in 6, in 72, or in 100 ounces of water, whereas, if LIEBIG's view were correct, the degree of concentration would be all-important. He suggested, therefore, an action on the intestinal nerves in explanation of the purgative effect produced. Shortly after, H. WAGNER—*Diss. de effectu natri sulphurici*, Dorpat, 1853—working under the direction of R. BUCHHEIM, who has republished the chief results obtained in an essay—*Ueber die Wirkung des Glaubersalzes*, Archiv für Phys. Heilkunde, Jahrg. 13, 1854, S. 93—arrived at results which seemed to show that solutions of the neutral salts, in virtue of their small capacity for diffusion, are very slowly absorbed from the alimentary canal; the foreign mass stimulates increased peristaltic movements and is speedily expelled as a watery stool. The experiments of MOREAU, VULPIAN, LAUDER BRUNTON and BRIEGER, cited above, show that this explanation also is insufficient, and that a physiological transudation (increased secretion) is probably produced by the purgative action of these salts.

certainty the degree of increased secretion and of catarrhal irritation attending the operation of the various cathartics. Meanwhile the practitioner can judge to some extent of the former by the quantity and quality of the stools produced, and of the latter by the gripings and other clinical phenomena which accompany the purgative action.

It may reasonably be expected that, especially in the early stages of a catarrhal inflammation of the intestinal mucous membrane, such as occurs in acute catarrhal diarrhœa and dysentery and in the catarrhal stage of diphtheritic dysentery, the action of purgatives which decidedly increase the intestinal secretion will relieve the congestion of the intestinal bloodvessels, and that, after the temporary increase of vascularity produced by their action has subsided, an improvement in the condition of the mucous membrane will follow. Whether the same benefits can be anticipated in chronic conditions is more doubtful; but even here moderate catharsis, occasionally induced, often proves beneficial, if only by washing out the abnormal contents of the alimentary canal. Lastly, the hope that, either in acute or chronic cases, the intestinal secretions can be beneficially modified by cathartics, except so far as it may be beneficial to increase their quantity and render them more watery, remains at present unsupported by experimental evidence.

(c) More satisfactory, though far from being all that could be desired, is the experimental evidence with regard to the third indication. The observations of Rutherford and Vignal especially show pretty conclusively that there are a number of cathartics which increase the biliary secretion. Some of these, on account of the intensity of the local irritation they produce, are ill-adapted for use in dysentery or the chronic fluxes; but others are medicaments whose mild and unirritating operation is well known, and which, as we have seen, have long been freely used in the treatment of these complaints. Among the neutral salts, sulphate of soda, phosphate of soda and Rochelle salt belong to this category. Rhubarb, long so celebrated in the treatment of dysentery, is also a decided cholagogue.* These are the cathartics upon which, in the present state of our knowledge, we ought to rely in the treatment of fluxes complicated with deficient hepatic secretion, instead of invoking the doubtful properties of calomel.

Diaphoretics.—The Greek physicians early observed the intimate connection between the functions of the skin and the bowels, as is shown by a striking passage in the writings of Hippocrates;† and diaphoresis was one of the modes of evacuating abnormal humors from the body enumerated by Galen;‡ yet I have found no distinct directions in any of

* Rutherford and Vignal—*op. cit.*, p. 722, *supra*—found no evidence of the possession of any cholagogue virtues by castor oil, gamboge or sulphate of magnesia; taraxacum and scammony acted very feebly upon the hepatic secretion; as to the action of croton oil, they were doubtful. Besides the substances mentioned in the text, their experiments indicate the possession of active cholagogue powers by colocynth, colchicum, podophyllin, aloes and jalap, the purgative operation of all of which was shown by dissection to produce considerable increased vascularity and other signs of intestinal irritation. Senna, which was much less objectionable in this respect, proved to be a very feeble cholagogue. Sulphate of potassa, an active cholagogue, as well as sulphate of magnesia, produced marked increase of intestinal vascularity, which was less decidedly or less uniformly the case with the purgatives mentioned in the text. Of special interest to the American practitioner are the experiments of these authors with Euonymin, Sanguinarin, Iridin and Leptandrin. The first three of these substances were pretty active stimulants of the hepatic secretion, but they produced also marked indications of intestinal irritation, so that whatever field of usefulness may hereafter be found for these drugs, they will probably not come into successful use in the treatment of the fluxes. Leptandrin, which was less objectionable in this respect, proved to possess but feeble cholagogue virtues.

† Hippocrates—*De Morb. Vulgar.*, Lib. VI, Sect. 3, [Ed. Littré, V, 293:] "Relaxation of the skin, constriction of the belly." Van Swieten—§ 722, T. II, p. 394, *op. cit.*, p. 663, *supra*—has cited this passage in support of the use of diaphoretics in the treatment of the fluxes; and the commentary of Galen—*Comm. III in Epidem. VI* § 1, [Ed. Kühn, XVII, B, pp. 1–7,]—seems to indicate that a similar application had been made before his time, though he himself did not approve of it. There are, it may be added, two other passages in the Hippocratic writings in which, under certain circumstances, the occurrence of sweating is said to be injurious to patients laboring under the fluxes, viz: in *Prænotiones Coacæ*, Sect. VII, § 628, [Ed. Littré, V, 731:] "In protracted bowel complaints, with vomitings, biliousness, and aversion to food, much sweating accompanied with adynamia kills suddenly." Also, in the same treatise, § 638, [same Vol., 733:] "Chilliness with sweating following upon liquid stools is bad."

‡ In his commentary upon the Hippocratic direction that superfluous humors should be expelled from the body—*De Morb. Vulgar.*, Lib. VI, Sect. 2, [Ed. Littré, V, 277,] Galen explains—*Comm. II in Epidem. VI*, § 2, [Ed. Kühn, XVII, A, 898,]—that this may be done by emetics, purgatives or clysters, through the urine, by sweating, &c.: "Quod videlicet nonnunquam redundantes humores sensibiliter evacuare convenit aut vomitionibus aut clysteribus aut purgatoriis medicinis aut per lotia aut per sudores aut per venæ scissionem aut per ani sanguiluas vocatas venas aut per uterum aut scarificando."

the Greek or Roman writings for the employment of this measure in the treatment of the fluxes.* It is, however, formally commended in the Canon of Avicenna,† and subsequent authors long continued to repeat the precept without, however, appearing to attach very great importance to it. During the sixteenth and seventeenth centuries several of the systematic writers on dysentery, who give, indeed, a more prominent place to other evacuants, refer also to the benefits of diaphoresis as an auxiliary measure; yet for the most part aimed to produce it only by covering the patient warmly in bed and by the use of external heat, obtained by hot bricks under the bedclothes, the hot bath and hot fumigations. These measures figure in the works of Hollerius and Felix Plater, while Hildanus, Sennertus and Riverius commemorate also the sudorific and alexipharmic virtues of the long-renowned but quite inert Bezoar stone.‡

Many of the iatro-chemists, however, paid greater attention to the use of diaphoretics in dysentery, holding that the blood poison they believed to cause the disease could be more thoroughly and promptly expelled in this way than by purgation.§ They invented a variety of distilled waters, each prepared from numerous ingredients, and some of which long enjoyed popular favor in the treatment of dysentery, being supposed to act not merely as diaphoretics but also as antidotes. Among these were the famous *aqua theriacalis*‖ and

* This was certainly not because diaphoretics were unknown to them, for it is easy to show, *e. g.*, by ÆTIUS—*Tetrab. I, Serm.* 3, *Cap.* 157, p. 175, Ed. cited p. 656, *supra*—that there were a number of substances which the Greeks believed to possess the power of provoking sweating if given internally, *e. g.*, cumin, bay berries, anise, artemisia, cardamom, castor, &c., with wine or hydromel, as well as certain stimulating liniments and fumigations. CELSUS—Lib. II, Cap. 17, Vol. I, p. 120, Ed. cited p. 656, *supra*—treats at length of the production of sweating either by dry heat or the hot bath and gives directions for the use of these measures in the treatment of fevers, but says nothing of their applicability to fluxes; in the treatment of which they were, however, frequently employed by the physicians of subsequent ages.

† I have already cited this passage from the *Canon* of AVICENNA—note §, p. 689, *supra*. A comparison of it with the citation from GALEN in note ‡, last page, will show that AVICENNA merely applied the general direction of GALEN to the particular case of the alvine fluxes.

‡ Thus HOLLERIUS—Lib. I, Cap. 40, fol. 132, *op. cit.*, p. 680, *supra*—writes: "Sudor excitatus plurimum prodest viribus valentibus, balneo aut suffumigio ex rebus sudores moventibus. Later calfactus et vino albo conspersus, involutus pannis adhibetur plantis pedum." In a marginal note he adds: "Aut etiam vasculum aqua fervente plenum, nisi resolutionis hepaticæ metus aliquis immineat." Similar are the teachings of FELIX PLATER—T. III, p. 811, *op. cit.*, p. 680, *supra*—who adds that these measures are especially useful if nature already tends toward perspiration, (maxime si natura eo vergat.) FAB. HILDANUS—Cap. 9, p. 684, *op. cit.*, p. 641, *supra*—approved of keeping the patients under warm bedclothes, that these malignant humors contained in the superficial veins might exhale, which exposure to cold might drive inward upon the viscera, but did not favor the use of diaphoretics (sudorifics) as a mode of evacuation, at least in the early stages of the disease. Nevertheless he relates that PHILIBERTUS, a celebrated Saracen physician of Lyons, had found in the Bezoar stone a happy remedy for epidemic dysentery, and had cured a great personage, who seemed about to die, by forty grains of it; half an hour after taking it the patient broke out into a warm sweat, soon fell asleep, and speedily recovered. HILDANUS declared that he had satisfied himself by experience that this is a most excellent remedy for dysentery, if the genuine article be used, and emphasizes the frequency of sophistications. SENNERTUS—*loc. cit.*, *infra*—quotes this story approvingly. Indeed the Bezoar stone enjoyed for a long time considerable reputation in the treatment of dysentery, being supposed to be not merely a valuable sudorific, but an alexipharmic by which the malignity of the disease could be combated. These views are confidently laid down by SAMUEL DALE—*Pharmacologia*, 3d Ed., London, 1737, p. 402—who writes "sudores ciet, alexipharmacus est," and enumerates dysentery, plague and malignant fevers among the many diseases in which, in his time, it was supposed to be useful. The genuine Bezoar orientale was a concretion found in the stomach of the so-called Bezoar goat or gazelle, an animal living in Persia and the East Indies, (probably the antilopus cervicapra:) and there can be now no doubt that the virtues attributed to it were entirely imaginary. Similar concretions from other animals were used, as the B. germanicum, from the chamois; B. occidentale, from the llama of Peru; and the B. hystricum, from the porcupine. The last was even more extravagantly prized than B. orientale, but the others much less so: see DALE—*op. cit.*, *passim*. SENNERTUS—p. 174, *op. cit.*, p. 645, *supra*—thought sudorifics especially useful to those on whom they act easily, and in malignant dysentery. RIVERIUS—Lib. X, Cap. 6, p. 395, *op. cit.*, p. 681, *supra*—writes that medicines prepared from Bezoar (bezoardica) and sudorifics are of great benefit, especially in malignant and epidemic dysenteries. Among the sudorifics he commends the famous *aqua theriacalis*, concerning which see note ‖, *infra*.

§ Thus DOLÆUS—*Encycl. Med. Dogm.*, Lib. III, Cap. 5, Opera, Frankfort, 1703, T. I, p. 238—writes: "Chemici egregia possident medicamenta, hoc in morbo probatissima, methodum seq. observantes, ab initio scilicet non purgantibus, sed diaphoreticis enm aggrediuntur, putant enim in dysenteria semper aliquid venenti subesse, potum ergo pestilentialem parant, aquam theriacalem propinant, post expulsionem veneni, confortativum et constrictivum exhibent."

‖ Their imperfect knowledge of the properties of bodies led the mediæval chemists to use many substances in the preparation of their distilled waters which were not volatile and could communicate no virtues to the product of the still. Nothing illustrates this better than the fact that distilled waters prepared from the flesh of pullets, capons and the like were long believed to represent in a concentrated form the nutriment of the meat. It would be a thankless task to give an abstract of the literature of this subject, but I may refer to the formulæ for the preparation of *aqua caponis*, *aqua pullorum*, &c., detailed by VALERIUS CORDUS—*Pharmacorum omnium, quæ in usu potiss. sunt, componendorum ratio, Vulgo vocant Dispensatorium sive Antidotarium*, Nuremberg, 1535; I cite the edition of 1592, emended and enlarged by the Nuremberg College of Medicine, pp. 166–7; JOSEPHUS QUERCETANUS—*Pharmacopœa dogmat. restituta*, &c., [1603,] Frankfort, 1607, p. 32. (This work does not describe the preparation I have mentioned in note †, p. 663, *supra*, which I believe is to be found in the *Dæticon Polyhistoricum* of the same author, Sect. III, Cap. 9, which I have not been able to see;) and VIDUS VIDIUS—*De Medicamentis*, Lib. VII, Cap. 5, Opera, Frankfort, 1626, T. III, p. 222. SENNERTUS—*Institutionum Med.*, Lib. V, Pars 3, Sect. 3, Cap. V Opera, Paris, 1641, T. I, p. 732—gravely combated the notion that these products were nutritive, declaring: "In eo autem nobis hallucinari, et errare ne non magnæ chymiæ peritiam prodere videntur." But error is hard to eradicate, and I find a formula for a distilled *aqua caponis* in the *Pharmacopœia Collegii Regalis*, London, 1677, p. 35 and several, including that of QUERCETANUS, are given by NICOLAS LEMERY—*Pharmacopée Universelle*, (1697:) I cite 3d Ed., Amsterdam, 1717, pp. 546–7—who still held them to be restorative and fortifying in the dose of two drachms to four ounces, although he admitted that the most nutritive part of the flesh remained in the still, and that a good bouillon would be better food. It may be added that the erroneous belief that these inert distillates were highly nutritious was exploded by the progress of chemistry, rather than by the acuteness of clinical experience

various antipestilential waters, such as the English *aqua epidemica.** At first these products consisted simply of distilled water flavored with the volatile oils of some of the drugs used; for all the more active ingredients were left behind in the still, a circumstance which did not hinder them from long enjoying the blind confidence of physicians. The later pharmacists, however, put into the still a good deal of wine or brandy, so that the resulting preparations contained much alcohol, which probably conferred upon them greater activity than all the other drugs employed.

Meanwhile the diaphoretic virtues of opium and antimony began to attract notice. Sylvius, who pointed out that all the preparations of opium produce perspiration, a doctrine which still survives,† employed the diaphoretic antimony of Basil Valentine in the

which had reposed blind confidence in them for two hundred years. Equally instructive is the lesson as to the danger of trusting to the every day bedside experience of the ordinary practitioner, unchecked by scientific observation and experiment, which is taught by the story of the two famous preparations referred to in the text. The *aqua theriacalis*, or treacle water of the English dispensatories, was a distilled water prepared in a great variety of ways, in accordance with the fancy of different chemists. This precious product derived its name from the circumstance that one of the substances put into the still was the long-renowned antidote or alexipharmic, Theriaca. This was a variously compounded mixture of many ingredients, among which figured always the pastilli theriaci, or lozenges prepared by boiling down the flesh of vipers and rubbing it up with bread. GALEN has discussed the earlier history of this subject at great length in *Ad Pisonem de Theriaca Liber*, [Ed. Kühn, XIV, 210,] and *De Theriaca ad Pamphilianum*, [same Vol., 295,] as well as in his treatise *De Antidotis*, [same Vol., 1.] How the subject still appeared to many minds as late as the beginning of the seventeenth century may be seen by the elaborate discussion of QUERCETANUS—Lib. I, Cap. 23, *De Theriacis*, p. 169 *et seq.*, *op. cit.*, *supra*. The theriaca, commonly employed in the preparation of the distilled water, was professedly modelled upon the theriaca of ANDROMACHUS the elder, who added the pastilles of vipers, and otherwise modified the famous antidote of MITHRIDATES. GALEN tells the story in the treatise cited above, and gives the formula in *De Antidotis*, Lib. I, Cap. 6, [Vol. cited, p. 32.] Having been repeated by PAULUS ÆGINETA—Lib. VII, Cap. II, Vol. III, p. 511, *op. cit.*, p. 624, *supra*—the English reader can conveniently compare the ingredients as given in the excellent translation of Dr. ADAMS with those of "The treacle of Andromachus, Venice treacle," described by WILLIAM SALMON—*The New London Dispensatory*, Lib. IV, Cap. 22, 3d Ed., London, 1685, p. 660—and JOHN QUINCY—*The Dispensatory of the Royal College of Physicians in London*, 2d Ed., 1727, p. 103; or compare the formula recorded by GALEN with that headed Theriaca Andromachi in the London Pharmacopœia of 1677, p. 102, cited *supra*. Both in its older and more modern forms the nostrum contained over sixty ingredients, several of them compounds. Besides the viper pastilles, to which superstitious importance was attached, it contained opium, squill and a great variety of astringents, aromatics, &c. It is stated in the *Edinburgh New Dispensatory*, 2d Ed., 1789, p. 585 *et seq.*, that theriaca and Mithridatum had then been for some time abandoned in the Pharmacopœias of both London and Edinburgh Colleges. The former substituted the confectio opiata, which, in a somewhat simplified form, still survives as the confection of opium in the United States Pharmacopœia. The Edinburgh College substituted a similar preparation under the name of the electuarium thebaicum. On the Continent, however, theriaca long survived. SAVIGNAC—p. 415, *op. cit.*, p. 620, *supra*—remarked, with some sarcasm, that under the name of thériaque it still figured in the French Codex, vipers' flesh and all, and hoped it would soon be banished. But it can be seen unmodified in the revised Codex of 1866, p. 506. Now the iatro-chemists conceived the unhappy idea of making a distilled water out of this famous compound which should represent its quintessence: and not content with its complexity they added, each according to his fancy, numerous other ingredients to the mixture introduced into the still. The resulting aqua theriacalis was named after its compounder, so that we read, for example, in VALERIUS CORDUS—p. 170 *et seq.*, *op. cit.*, *supra*—of the aqua theriacalis Lugdunensis, the aqua theriacalis Sylvii and the aqua theriacalis Rondeletii; and various other formulæ are given by QUERCETANUS—p. 24 *et seq.*, *op. cit.*, *supra;* VIDUS VIDIUS—p. 235, *cap. cit.*, *supra;* NICOLAS LEMERY—p. 528 *et seq.*, *op. cit.*, *supra*—and others. The aqua theriacalis of the London Pharmacopœia of 1677—p. 32, Ed. cited, *supra*—contained no less than nine herbs, leaves, roots and juices, besides theriaca and a modification of the antidote of MITHRIDATES, (imitated from the Galenical preparation of that name and containing almost as many ingredients as theriaca: see p. 100, *op. cit.*) The older iatro-chemists depended upon the drugs introduced into the still for the virtues of the product, but after a time Canary and other wines were added, as in the formula of the London Pharmacopœia, and at a later date French brandy in such quantities that the product must have been rich in alcohol. For example, JOHN QUINCY—p. 9, *op. cit.*, *supra*—gives the formula as follows: "*Aqua Theriacalis. Treacle Water.* Take of the juice of green walnuts four pints; of the juice of rue three pints; of carduus and baum, each two pints; of the fresh gathered butter-bur roots one pound and an half; of burdock one pound; of angelica and master-wort, each half a pound; of green scordium four handsful; of old Venice treacle (*i. e.*, theriaca) and Mithridate, each eight ounces; of lemon juice two pints; of French brandy one gallon and an half. Draw off by distillation three gallons and an half, and then add four pints of distilled vinegar." The confidence reposed for more than two hundred years in the sudorific as well as the alexipharmic virtues of these comparatively inert distillates is well indicated by the passages cited from RIVERIUS in note ‡, and DOLÆUS in note §, last page. It would be easy to multiply such citations did space permit.

* I suppose the "potus pestilentialis" referred to by DOLÆUS, in the passage just cited, includes the whole group of compound distilled waters which the iatro-chemists supposed to act as sudorifics and antidotes in plague and other pestilential diseases, such as the aqua vitæ of Arnold de Villanova, described by VALERIUS CORDUS—p. 170, *op. cit.*, *supra*—the aqua ad pestis curationem et præservationem, and aqua ad febres pestilentes of QUERCETANUS—p. 33 *et seq.*, *op. cit.*, *supra*—and the various similar nostrums invented by others. For the most part, whatever herbs were put into the still in preparing these distillates, theriaca or Mithridate, or both, were added also, so that in their general character these were akin to the treacle waters. One of the most celebrated of them was the aqua epidemica or plague water of the London Pharmacopœia, which I mention because its use in dysentery was sanctioned by the authority of SYDENHAM—*Med. Obs.*, Sect. IV, Cap. 3, Vol. I, p. 171, *op. cit.*, p. 407, *supra*. This water was prepared without theriaca or Mithridate by distilling a mixture of roots or herbs with white wine or brandy. Several different formulæ were used: for that of the London College, see the Pharmacopœia of 1677, p. 29, cited *supra*. The formula of BATE, which long enjoyed great credit among the English physicians, is thus given by WILLIAM SALMON—*Pharmacopœia Batcana: or, Bate's Dispensatory*, London, 1694, p. 12—"*Aqua Epidemica, The Plague-Water.* [Bate.] ℞. Celandine rosemary, rue, sage, mugwort, worm-wood, pimpernel, dragons, scabiouse, agrimony, baum, scordium, lesser century, cardnus benedictus, betony, ros solis, of each two handfuls: Roots of angelica, tormentil, gentian, zedoary, liquorice, of each one ounce. Macerate in white wine lb viii, for two days, then distil according to art." SALMON adds the following interesting remark: "In my opinion, if three or four good large lemons were thin sliced and put (after distillation) into the water, it would be so much the better, for that the particles of that acid juice certainly destroy all the vermiculi, or miasmata, which are the progenerators of the plague, or pestilence; and also more powerfully overcome it when the infection is begun. For this reason it is, vinegar is put into almost all our plague-waters, by Sylvius, Barbet, and others of the more learned physicians." In concluding this note I must refer to the aqua dysenterica of QUERCETANUS—p. 38, *op. cit.*—which was distilled from a great variety of drugs, including myrobalans, opium and a large proportion of the astringents and aromatics at that time used in dysentery. It is mentioned by SENNERTUS—T. III, p. 179, *op. cit.*, p. 645, *supra*—in connection with several other antidysenteric distilled waters invented by various physicians. As late as the beginning of the eighteenth century a distilled aqua antidysenterica is described by NICOLAS LEMERY—p. 583, *op. cit.*, last note.

† SYLVIUS—*De Meth. Med.*, Lib. II, Cap. II, Opera, p. 107, Ed. cited p. 690, *supra:* "Hoc imprimis verum de opio, cujus præsertim ratione sudores movent omnia opiata."

treatment of the fluxes.* In this he was followed by Hoffmann, who attached great importance to the action of diaphoretics in dysentery, especially in its malignant and epidemic forms.† About the same time Freind, having observed that ipecacuanha often excited a profuse sweat, suggested that it owed its efficacy in dysentery to this circumstance,‡ and Wilson subsequently drew attention to the fact that this operation of ipecacuanha was rendered much more energetic and certain when opium was added.§ The employment of this combination or of some preparation of antimony alone or with opium, in the treatment of dysentery, speedily came into common use.

Degner, indeed, protested against resorting to diaphoretics in dysentery,‖ and Stoll expressed the opinion that the cases reported to have been cured by diaphoretic antimony, broken doses of ipecacuanha and opium and other sudorifics, could have been only simple uncomplicated cases of rheumatismal (catarrhal) dysentery;¶ but these remedies nevertheless continued to be very generally employed, though for the most part in subordination to purgation and other more active measures. Moseley, however, went so far as to vaunt diaphoresis as the most important part of the treatment of dysentery, relying upon James's powder, glass of antimony or even ipecacuanha for the purpose. His extravagant views obtained few followers,** yet the use of diaphoretics in dysentery has continued to find advocates to the present time. Tartar emetic in broken doses†† has for the most part

* SYLVIUS—*Praxeos*, Lib. I, Cap. 13, p. 183, *op. cit.* The antimonium diaphoreticum enters into one of the formulæ he advises for the treatment of purulent or sanious fluxes, and he commends opium in the treatment of dysentery. In *De Meth. Med.*—*loc. cit.*, last note—he commends as sudorifics not only antimonium diaphoreticum, but Bezoardicum minerale. The first was prepared by igniting together antimony and nitre, a white hard mass being thus formed, which was subsequently powdered and thoroughly washed with hot water until no taste of the nitrous salt remained. See BOERHAAVE'S *New Method of Chemistry*, English Transl., 2d Ed., London, 1741, Vol. II, p. 339. This preparation dates back to BASIL VALENTINE—p. 113, *op. cit.*, p. 689, *supra*—but it was also used without washing, and was then known as the diaphoretic antimony with nitre. BOERHAAVE—*loc. cit.*—preferred it unwashed, declaring the common or washed preparation to be "an indolent, noxious calx, without any activity discoverable by observation." It has, however, held its ground, and I find in the French Codex of 1866, p. 150, a formula for an antimoine diaphorétique lavé, which differs only in the proportion of the ingredients from that of BASIL VALENTINE. The Bezoardicum minerale was so called because its virtues were supposed to be similar to those attributed to the Bezoar stone: see note ‡, p. 729, *supra*. JOHN QUINCY—p. 246, *op. cit.*, last page—states that it was originally the contrivance of CROLLIUS. It was prepared in various ways by different chemists, a common method being the action of spirits of nitre (nitric acid) on butter of antimony. This is the method directed in the London Pharmacopœia of 1677, p. 189, Ed. cited p. 729, *supra*. It is interesting to note the substances commended by SYLVIUS for their diaphoretic virtues in the chapter just cited, viz: A number of merely aromatic herbs, as well as guaiac wood, sassafras wood, juniper wood, the leaves and seed of carduus benedictus, &c.; then various volatile salts; the Eastern and Western Bezoar stones; and besides the opiates and antimonials mentioned above, the mercurius præcipitatus diaphoreticus, which he directs to be prepared by the addition of oil of tartar to a solution of corrosive sublimate in water, and given in the dose of 4 to 6 grains. The mercurius præcipitatus diaphoreticus was originally invented by PARACELSUS, in whose treatise—*De Natura Rerum*, Lib. V, T. II. p. 94, *op. cit.*, p. 336, *supra*—an account of his method of preparation will be found. This method, that given by J. BEGUIN—*Tyrocinium Chymicum*, (1614;) I cite the Ed. of Wittenberg, 1650, p. 332—and that described by SYLVIUS differ considerably, a question into which my space does not permit me to enter; but the mercurius diaphoreticus is worthy of mention here, although it has long since gone out of use, because of the employment of other preparations of mercury as diaphoretics in quite modern times. In this place I may speak of the practice of WILLIS—p. 81 *et seq.*, chapter cited p. 680, *supra*—who gave diaphoretics the first place in the treatment of the London dysentery, but held fast to the treacle of ANDROMACHUS, prepared coral and prepared pearl, variously combined with the so-called sudorific herbs, &c., and with preparations of opium, instead of venturing to give his dysenteric patients the Bezoar mineral and diaphoretic antimony, which he commends loudly enough in his chapter on the general subject of diaphoretics—Sect. V, Cap. 2, p. 122 *et seq.*, *op. cit.*—to which I refer the reader for a curious list of the substances he believed to possess diaphoretic properties.

† FRID. HOFFMANN—*Med. Rat. Syst.*, pp. 156 and 158, chapter cited p. 681, *supra*. He recommended that they should be admixed with absorbentia, and gives quite a list of the substances that may be thus used.

‡ J. FREIND—*De Febribus Commentarii Novem*, (1717,) Comm. IV; I cite Opera, London, 1733, p. 253. This suggestion appears to have made a great impression at the time, if I may judge from the manner in which it is discussed by BAKER—p. 27, *op. cit.*, p. 437, *supra*; AKENSIDE—p. 40, *op. cit.*, p. 681, *supra*; MOSELEY—p. 220, *op. cit.*, p. 648, *supra*, and others.

§ WILSON—p. 33 *et seq.*, *op. cit.*, p. 681, *supra*—in consequence of his peculiar views of the nature and causation of dysentery, attached great importance to the use of sudorifics in the treatment. He employed them especially to resist the "tendency of the blood to solution." He commended the spiritus Mindereri, and those diaphoretics "which are also called alexipharmics, cardiacs, or antiseptics;" but especially emphasized "the certain effect which an anodyne has of converting ipecacuan. into a powerful diaphoretic," p. 45. I may note here that AKENSIDE—*loc. cit.*—writing three years later, although he admitted that ipecacuanha conjoined with opium elicited more abundant sweats than any other sudorific, objected to this mode of treatment, lest the patient should take cold by going frequently to stool while sweating, and therefore gave the ipecacuanha without opium in grain doses every six hours, claiming that it altered the condition of the intestines without causing either vomiting or sweating.

‖ DEGNER—Cap. V, § 23, p. 279, *op. cit.*, p. 625, *supra*. ¶ STOLL—Cap. 2, p. 252 *et seq.*, *op. cit.*, p. 312, *supra*.

** MOSELEY—p. 219 *et seq.*, *op. cit.*, p. 648, *supra*. With regard to glass of antimony and cerated glass of antimony, see p. 690, *supra*. James's powder, of late years described in the British Pharmacopœia as pulvis antimonialis, is a mixture of one part of oxide of antimony with two of precipitated phosphate of lime. Among those who most heartily embraced the views of MOSELEY I may mention HARTY—p. 178 *et seq.*, *op. cit.*, next page.

†† Among those who have employed broken doses of tartar emetic or antimonial wine for this purpose, I may mention WADE—*op. cit.*, p. 706, *supra*; RICHTER—*Med. u. Chir. Bemerk.*, Bd. I, Gottingen, 1793, S. 99; CHRISTIE—*op. cit.*, p. 706, *supra*; ANNESLEY—Vol. II. p. 280, *op. cit.*, p. 621, *supra*; and G. B. WOOD—Vol. I, p. 721, *op. cit.*, p. 671, *supra*—who, however, limited their employment to cases in which the skin was hot and dry. I would remark that in this and subsequent notes I have made no attempt to present a complete list of authorities, but merely cite a few of the prominent advocates of each measure.

replaced the use of other antimonials for this purpose, and ipecacuanha has been very generally given in the form of Dover's powder.* The old notion of the diaphoretic action of mercury, revived by Harty, has been accepted by some who claim this, among other benefits, from the use of calomel or blue mass in broken doses especially when combined with opium and ipecacuanha.† The solution of acetate of ammonia and the solution of citrate of potash have also had their advocates.‡ The use of the hot bath, long ago employed in dysentery by Alexander of Tralles, has also found favor, some even going so far as to attribute to it the power of jugulating the disease in its early stages.§ Hot vapor baths, dry heat and alcoholic fumigations have also been commended.‖

On the other hand, serious objections to the use of diaphoretics in dysentery have been urged during the present century. Some have emphasized the danger of taking cold while going to stool, others have pointed out that most of the substances employed as diaphoretics are irritating to the intestinal mucous membrane; moreover, the alleged beneficial effect of diaphoresis upon the progress of dysentery has been doubted or altogether denied.¶ As a consequence their employment has become less and less general, and several of the best modern writers on dysentery, as Trousseau, Barrallier and Maclean, do not even discuss the use of medicines of this class.** During our own civil war Dover's powder was sometimes given as a diaphoretic, but other sudorifics were little used.††

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* Dover's powder, as first described by THOMAS DOVER (DOVAR in this Ed.)—*The Ancient Physician's Legacy to his Country*, London, 1733, p. 11—who employed it in the treatment of gout, consisted of one part each of opium, ipecacuanha and powdered liquorice, and four parts each of nitre and vitriolated tartar, (sulphate of potassa.) As is well known, both the British and United States Pharmacopœias omit the nitre and liquorice, using one part each of opium and ipecacuanha to eight of sulphate of potassa, while the French Codex retains the formula of Dover, with the exception that the extract of opium is substituted, so that the resulting preparation is more active in this ingredient. Among the prominent advocates of the diaphoretic use of ipecacuanha and opium in dysentery may be mentioned PRINGLE—p. 263, *op. cit.*, p. 640, *supra*—who, in his later practice, substituted this combination for the cerated glass of antimony; GILBERT BLANE—Part III, Chap. 2, p. 453, *op. cit.*, p. 637, *supra;* ANNESLEY—Vol. II, p. 280, *op. cit.*, p. 621, *supra;* BANKIER—p. 191 *et seq.*, *op. cit.*, p. 637, *supra;* and more recently NIEMEYER—Bd. II, S. 756, *op. cit.*, p. 645, *supra;* JACCOUD—T. II, p. 341, *op. cit.*, p. 649, *supra;* AITKEN—Vol. II, p. 660, *op. cit.*, p. 647, *supra;* and STILLÉ—p. 364, *op. cit.*, p. 650, *supra*.

† WILLIAM HARTY—*Obs. on the simple Dysentery and its Combinations*, London, 1805, p. 192 *et seq.* Among those who have shared these views I may particularly mention ANNESLEY—Vol. II, p. 279, *op. cit.*, and BANKIER—p. 194, *op. cit.*

‡ The liquor ammoniæ acetatis, formerly known as the spirits of Mindererus, figures among the diaphoretics commended by WILSON—*loc. cit.*, note §, last page; DONALD MONRO—p. 76, *op. cit.*, p. 625, *supra;* BANKIER—*loc. cit.*, note *, *supra*, and many modern writers. The citrate of potassa was formerly known as the salt of Riverius. I find a formula for its extemporaneous preparation in *The Edinburgh New Dispensatory*, 2d Ed., 1789, p. 540, borrowed from the *Pharmacopœa Succica*, Ed. alt., Stockholm, 1779, which I have not seen. It is described as the "mixtura salina, saline mixture or julep," and directed to be made by adding lemon juice and simple syrup to a solution of fixed vegetable alkali in water. The remark is appended that it is in daily use as a gentle diaphoretic among British practitioners. WADE—*loc. cit.*, note ‖, last page—describes it as the neutral mixture, and used it with the addition of two, three or more grains of tartar emetic to the pint as a diaphoretic in dysentery. The use of this combination or of the neutral mixture is commended by many subsequent writers.

§ ALEXANDER OF TRALLES—Lib. VIII, Cap. 9, p. 460, Ed. cited p. 624, *supra:* "Adhæc utatur æger maxime inter initia balneo crebriore, et calidiore solio, magisque, si aquæ potio et frigidorum ciborum esus præcesserit, ne pituitæ suspicio sit." BAKER—p. 34, *op. cit.*, p. 437, *supra*—relates the case of a patient, who, having been sick with dysentery a whole week, was speedily cured by a warm bath. FOURNIER et VAIDY—p. 386, *op. cit.*, p. 362, *supra*—reported that they frequently saw, in the French army, officers reduced to a desperate condition by dysentery, who owed their recovery chiefly to warm baths; and remarking that under such circumstances soldiers almost always die, suggested that proper conveniences for the administration of warm baths should be furnished at every military hospital; a suggestion with which I heartily concur, although for other reasons. Among those who have highly praised the use of the warm bath in dysentery I may mention our own BENJAMIN RUSH—*Med. Inquiries and Obs.*: I cite the 2d Ed., Philadelphia, 1794, Vol. I, p. 260—who remarked that the dysentery, prevailing in the summer of 1777 in the military hospitals in New Jersey, "was frequently followed by an obstinate diarrhœa, in which the warm bath was found in many cases to be an effectual remedy." See, also, HARTY—p. 183, *op. cit.*, *supra;* ANNESLEY—Vol. II, p. 281, *op. cit.*, p. 621, *supra;* NAUMANN—Bd. IV, Abth. 2, S. 80, *op. cit.*, p. 645, *supra;* and SAVIGNAC—p. 334, *op. cit.*, p. 620, *supra*—who, however, on account of the inconvenience of general baths, gives the preference to warm hip-baths, in which, to increase their soothing effect, he sometimes infused the leaves of solanum nigrum (morelle) or belladonna.

‖ With regard to the first two of these measures, see COPLAND—Vol. I, p. 729, *op. cit.*, p. 682, *supra*. Fumigations with vapor of alcohol have been especially commended by SAVIGNAC—p. 336, *op. cit.*, last note—in cases of chronic dysentery. He introduces the patient into a closed space of wood or waxed cloth, from which his head only projects, and into which the fumes of a large alcohol lamp are conveyed through a tin tube. These vapors consist largely of vapor of water, which, however, carries some volatilized alcohol with it. The patient remains in the bath fifteen or twenty minutes.

¶ The danger of taking cold while rising for stool has been emphasized, among others, by MOREHEAD—p. 302, *op. cit.*, p. 657, *supra*. Of course it would be avoided if the rule laid down on p. 656, *supra*, were strictly observed. Among those who have pointed out that the medicaments relied upon as diaphoretics are for the most part irritating to the intestinal mucous membrane, NAUMANN—Bd. IV, Abth. 2, S. 81, *op. cit.*, p. 645, *supra*—may be mentioned. Doubts as to the curative effects claimed for diaphoretics are expressed by BAMFIELD—p. 138, *op. cit.*, p. 682, *supra;* and ROCHE—p. 355, *op. cit.*, p. 725, *supra*—declares that their reputation for efficacy has not been well established.

** TROUSSEAU—*op. cit.*, p. 664, *supra;* BARRALLIER—*op. cit.*, p. 603, *supra;* MACLEAN—*op. cit.*, p. 657, *supra;* HEUBNER—*op. cit.*, p. 529, *supra*. It would be easy to add to this list.

†† Among the reporters in Section II, BROWN—p. 77, *supra;* JONES—p. 85, *supra;* and TAYLOR—p. 87, *supra*—commended the use of Dover's powder. SCHÄFFLER—p. 44, *supra*—praised solution of acetate of ammonia combined with laudanum. WHITE—p. 85, *supra*—prescribed "diaphoretics" in combination with calomel; and PENROSE—p. 45, *supra*—who attached great importance to "attention to the condition of the surface" in chronic dysentery, commended the use of frequent hot baths.

I am myself inclined to agree with those who doubt whether any material effect upon the progress of dysentery or the other fluxes can be obtained in this way. The antimonials should, I think, be rejected for the reasons already given. Whatever benefit may result from the use of ipecacuanha seems to depend upon its influence on the intestinal mucous membrane rather than its action on the skin. The question of the use of opium will be discussed further on; but it may be remarked here that its diaphoretic operation is probably the least important circumstance to be considered in determining whether it shall be used in any particular case. As for the other diaphoretic medicines, they should be avoided as likely to perturb the stomach or intestines without equivalent benefit. Nor do I view with favor the use of the hot bath in acute dysentery, though hot bricks or bottles of hot water may sometimes be advantageously applied when the extremities are cold, and during the stage of collapse. In chronic fluxes, however, when the skin is dry or covered with furfuraceous scales, the warm bath may be resorted to with benefit.

DIURETICS.—The ancient physicians paid even more attention to the use of diuretics in the treatment of the flûxes than they bestowed upon sudorifics. Diocles of Carystus, who flourished shortly after Hippocrates, directed their use in dysentery partly that the superabundant moisture of the body might be dried up, partly on account of their effect in relieving the troublesome vesical symptoms.* It was one of the general principles of the humoral pathology, as taught by Galen,† that peccant humors might be evacuated from the body by remedies which promote the secretion of urine; and this mode of diverting the materies morbi from the alimentary canal in dysentery was formally commended by Celsus and some of the later Greeks, as well as by the Arabian writers. Celsus, however, insisted that diuretics should be administered in this disease to such patients only as previous experience had shown to be readily affected by their operation, alleging that if they failed to act on the kidneys they aggravated the flux.‡

Many subsequent physicians, until after the beginning of the eighteenth century, adopted diuretics as a part of their routine in the treatment of dysentery, but for the most part cautioned against giving them early in the disease, before the free use of purgatives or other evacuants had diminished the abundant morbid humors, alleging imaginary dangers in explanation of this precaution.§ During the eighteenth century, however, the use of

* I find no direct mention of the use of diuretics in the Hippocratic writings, but the following passage seems to hint at their employment in lientery: "This disease needs treatment until the urine flows in proportion to the drink taken, the body is nourished by the food ingested, and it is freed from its bad color," *Prædictorum*, Lib. II, § 23, [Ed. Littré, IX, 53.] The teachings of DIOCLES on this subject have been preserved by CŒLIUS AURELIANUS in his chapter on Ventriculosa Passio, or Cœliacus—*Morb. Chron.*, Lib. IV, Cap. 3, p. 521, Ed. cited p. 664, *supra*: "DIOCLES quoque libro quo de passionibus atque causis, et curationibus scripsit, providens siccandum corpus, urinalibus medicaminibus utendum jubet, quibus non solum humor ventris siccari minime posse perspicitur, verumetiam vesica in morbos cogi invenitur." GRUNER—*Bibliothek der Alten Aerzte*, Theil II, Leipsic, 17[illegible] S. 623—understands this passage to refer to the treatment of the cœliac affection, and most of those who have cited it take the same view on account of the subject of the chapter in which it is preserved; I must, however, agree with HALLER—*Bibl. Med. Pract.*, T. I, Basel, 1776, p. 111—in understanding it to refer to dysentery; for in this disease the bladder is frequently involved, as DIOCLES observed, which is rarely the case in the cœliac flux.

† For the authorization of the use of diuretics for this purpose by GALEN, see note ‡, p. 728, *supra*. I have, however, found no specific directions in his writings for the administration of the diuretics in dysentery.

‡ CELSUS, in his chapter on dysentery—Lib. IV, Cap. 15, Vol. I, p. 297, Ed. cited p. 656, *supra*—wrote as follows: "But these things which promote the urine have a good effect, if they succeed, by determining the fluids into another part; if they do not, they increase the mischief: therefore they must not be administered, except to those on whom they have been accustomed to produce that effect readily." Among the later Greeks AËTIUS—Tetrab. III, Serm. 1, Cap. 47, p. 609, Ed. cited p. 656, *supra*—commends diuretics [alia etiam urinam ciendo] in both dysentery and the cœliac flux; PAULUS ÆGINETA—Lib. III, Cap. 40, Vol. I, p. 521, Ed. cited p. 624, *supra*—strongly recommends them in the cœliac flux and lientery; and ACTUARIUS—*Medicus, sive De Meth. Med.*, Lib. IV, Cap. 6; I cite the Latin version of MATHISIUS in the *Med. Artis Principes* of H. STEPHANUS, Paris, 1567, p. 226—in the alvine fluxes generally. A list of the medicines regarded as suitable for this purpose, such as parsley, maiden hair and various compounds, is given by PAULUS—*loc. cit.* The views of the Arabians on the subject are summarized in the passage cited from AVICENNA in note ‖, p. 689, *supra*.

§ Thus ALTOMARUS—*loc. cit.*, p. 689, *supra*—repeats with approval the opinions of CELSUS and ÆTIUS. FORESTUS—*loc. cit.*, p. 689, *supra*—in like manner cites CELSUS, but counsels that the use of diuretics be postponed till after the first few days of the disease, lest in moving such [illegible] of morbid humors the narrow passages through which they pass should be ulcerated. (What narrow passages he meant may be inferred from the explanations of HILDANUS and SENNERTUS, cited below.) FELIX PLATER—*loc. cit.*, p. 689, *supra*—did not allude to this supposed danger, but counselled without reservation, that a part of the morbid humors should be evacuated through the urinary organs, and advised for this purpose a mixture containing the four greater cold seeds (viz: cucumber, pumpkin, gourd and muskmelon) with the seeds and root of asparagus, &c. FAB. HILDANUS—*loc. cit.*, p

diuretics in the fluxes fell into disuse, and few modern writers appear to attach much importance to their administration in these disorders.

It may readily be admitted that the indications for remedies of this class afforded by the humoral pathology are no longer valid, and that although the relation between the functions of the kidneys, bowels and skin is as fully recognized now as in the early days of Greek medicine, we possess no satisfactory evidence that the induction of an increased secretion of urine can, of itself, exercise any perceptible effect on the progress or duration of an inflammatory process affecting the intestinal mucous membrane. Nevertheless the marked diminution in the quantity of urine, sometimes amounting almost to complete suppression, as well as the strangury and vesical tenesmus so common in acute dysentery, seem to afford an indication for the employment of diuretics. The first of these symptoms, which is often connected with a condition of the kidneys more serious than mere functional disorder,* must cause more or less accumulation of urea in the blood, a part of which is likely to be excreted by the bowels, and, breaking up into carbonate of ammonia, to aggravate the intestinal lesions.† Moreover, the scanty urine in this condition is often highly acid and likely to perturb the irritable urinary bladder.

Yet the dictum of Degner, that when diminished secretion or even suppression of urine occurs in dysentery it requires no treatment unless accompanied by vesical tenesmus or strangury, appears to have been generally accepted; and even for the relief of local symptoms the employment of diuretics has found few modern advocates.‡ For myself, I favor their use not only on this account, but also with the deliberate object of increasing the secretion of the kidneys whenever it is notably diminished; I would suggest the bitartrate of potash, which, in laxative doses, produced such beneficial results in the hands of Zimmermann and Cheyne, or acetate of potash, which Coues found so efficacious in relieving vesical tenesmus; possibly, also, atropia may sometimes prove useful for this purpose, as will be shown further on.§ Other diuretics may perhaps be substituted with equal advantage,

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680, *supra*—advises that diuretics should be administered only after thorough purgation, otherwise he says the acrid and malignant humor, while it passes through the mesenteric veins and liver on its way to the kidneys, may injure those important organs. He commends as a diuretic the roots of parsley, fennel and anise boiled with flesh, and the broth given an hour before each meal. In Cap. 19, p. 695, *op. cit.*, he directs the use of various hip baths, clysters, &c., to relieve the retention of urine and vesical tenesmus, or even diuretics if necessary, but with the caution already mentioned. SENNERTUS—*loc. cit.*, p. 689, *supra*—expresses very similar views, and repeats the same warnings. BOERHAAVE—*Aph.* 722, and VAN SWIETEN—T. II, p. 395, *op. cit.*, p. 663, *supra*—advises diuretics in dysentery for the purpose of diverting the humors from the intestine, without alluding to these imaginary dangers.

* See pp. 460 and 560, *supra*.

† Compare the views of TREITZ and ZIMMERMANN, cited p. 386, *supra*, with the suggestion of VIRCHOW, discussed on p. 631, *supra*, as to the part played by ammoniacal compounds liberated in the alimentary canal in transforming simple catarrhal inflammation into diphtheritic dysentery.

‡ DEGNER—Cap. 3, § 72, p. 184, *op. cit.*, p. 625, *supra*—remarked: "Ubi urinæ suppressio aderat, nec tamen illa incommodi quidquam pariebat, nulla indigebat medela;" but when vesical tenesmus, or dysuria or strangury, which he attributed to sympathy (consensus) between the neck of the bladder and the rectum, was present, he gave balsamum sulphuris simplex or anisatum in decoction of simaruba, which he declared produced admirable results, especially at the beginning of the disease. The balsamum sulphuris simplex was made by heating one part of flowers of sulphur with four of olive oil, and the bals. sulph. anisatum by boiling flowers of sulphur with oil of anise in the same proportions: see JOHN QUINCY'S *Compleat English Dispensatory*, 12th Ed., London, 1749, Part II, pp. 25 and 26. J. G. RADEMACHER—*Libellus De Dysenteria*, Cologne, 1806, p. 147—in discussing the difficulty of urination, which he declares is a most common accident in dysentery, remarks that the kidneys also are often sympathetically involved, as shown by the diminution of the secretion, which is often insufficient in quantity to distend the bladder, although the patient does not urinate for a whole day; but he remarks that it is vain to administer diuretics, and that they are unsuitable or, if they augment the intestinal movements, injurious. He also objected to the use of diuretics for the relief of vesical complications, and advised warm applications to the lower part of the abdomen instead. He rarely observed actual retention of urine during the epidemic at Cleves, but in one patient, an old man, in whom this symptom was so troublesome that the frequent use of the catheter was required, relief was at length obtained by the administration of the flour of lycopodium, two drachms in six ounces of syrup; dose a tablespoonful every hour. SCHWEICH—S. 403, *op. cit.*, p. 717, *supra*—also commended lycopodium, which he combined with emulsion of flaxseed or sweet almonds for this purpose. PARKES—p. 147, *op. cit.*, p. 682, *supra*—merely advises the warm bath or cold water injections for the relief of the vesical symptoms in dysentery; and VOGT—S. 219, *op. cit.*, p. 645, *supra*—thought warm emollient drinks and fomentations quite sufficient, unless there was actual retention, in which case he employed warm soda baths followed by narcotic cataplasms or fomentations and the use of the catheter if necessary; he also praised the internal administration of belladonna as preferable to opium in these cases. On the other hand, a few physicians have recommended diuretics when the urine is scanty; as for example BAMFIELD—p. 163, *op. cit.*, p. 682, *supra*—who remarks: "When the strangury, ardor urinæ, etc., are caused by the paucity of urine or its acrimony, the patient should be encouraged to drink plentifully of mild mucilaginous and demulcent diluents; should be ordered some diuretic, by which the urinary secretion may be promoted and increased, and fomentations should be employed from the abdomen to the nates." In this connection I may refer to the suggestion of MOREHEAD—p. 284, *op. cit.*, p. 657, *supra*—that retention of urine very often results from inflammation of the peritoneal coating of the bladder, as a hint worthy of consideration.

§ For the experience of ZIMMERMANN and CHEYNE, see the passages cited note ‖, p. 707, *supra*; for the practice of COUES, see p. 63, *supra*.

but care should be taken to avoid those that are likely to irritate the inflamed intestines. That any benefit is to be expected in the fluxes from remedies of this class, except for the purposes just indicated, may be admitted to be highly improbable.

OPIUM AND ITS PREPARATIONS.—A knowledge of the anodyne and soporific virtues of certain plants, especially the poppy, probably dates back to prehistoric times; and their use for the relief of the pain that so often accompanies the fluxes must be equally old.* It is true that the Hippocratic writings are silent as to this application of narcotics, but it must be remembered that the Hippocratic treatise on Pharmacy, in which it might be expected to be discussed, has unfortunately been lost.† We have, however, the testimony of Cælius Aurelianus that Diocles of Carystus used the juice of the poppy combined with nutgalls in the treatment of dysentery.‡ When Galen wrote, the liberal use of opium, hyoscyamus and other anodynes in the treatment of all painful fluxes was already the general practice, as is shown by the numerous often very complex formulæ, both for administration by the mouth and the rectum, which he has handed down.§ Similar formulæ have been preserved by Ætius, Alexander of Tralles and Paulus Ægineta;‖ but it is worthy of note that Celsus is silent with regard to the use of anodynes in the fluxes, and that Galen expressly cautions against the danger of using them in excessive quantities.¶

Alexander of Tralles, in a remarkable passage, declared that unskilful physicians fall into the error of giving pastilles of opium, hyoscyamus, mandrake and other anodynes in dysentery for the purpose of relieving the pain by sleep, but that after the patient has slept with apparent benefit through the night, it will be found he passes next morning the great quantity of humors meanwhile accumulated, suffers with headache and loss of strength, and that his flux is made worse; for himself, he thought such medicines should never be given except when strong necessity urges.** The Arabian physicians exercised similar caution.

* Thus, in the *Odyssey*, Lib. IV, 219–226, HOMER relates that Helen gave Telemachus a sorrow-lulling (νηπενθές) drug, (φάρμακον,) which had the property of producing forgetfulness and sleep. He adds that she obtained it from Polydamna, wife of Thon, an Egyptian; and that Egypt produces many powerful drugs, some excellent and others poisonous. It seems to me more reasonable to agree with SPRENGEL—Bd. I, S. 93, *op. cit.*, p. 345, *supra*—and others that the drug referred to was opium or some other narcotic, (thus CHRISTEN—I cite from the review of his *History of Opium* in the Edinburgh Jour. of Med. Sci., Vol. II, 1826, p. 371—thinks it was Indian hemp,) than to suppose with JOHN J. OWEN—Notes to his edition of the *Odyssey*, New York, 1872, p. 407—that the description is "put allegorically for the charm of attractive conversation by which grief is banished insensibly from the mind."

† The lost book is mentioned in the Hippocratic treatise *De Affectionibus*, § 23, [Ed. Littré, VI, 235] where, in connection with the treatment of dysentery, we are told that further particulars with regard to the drinks, broths and food, are written in the book on Pharmacy, (ἐν τῇ φαρμακίτιδι·) or, as KÜHN—T. II, 401—translates it, "prout in medicamentorum tractatione scriptum est." The use of the juice of the poppy as an anodyne was, however, well known at this time, as may be seen from several passages in the Hippocratic writings: see, for example, the treatise *De Morbis Mulierum*, Lib. II, § 201, [Ed. Littré, VIII, 387,] where mention is made of the juice of the poppy and of the sleep-producing poppy, (ὀπὸς μήκωνος καὶ ὑπνωτικὸν μηκώνιον.) A description of the mode of collecting opium from the poppy capsules, and a declaration that the extract made from the entire plant is less active, will be found in DIOSCORIDES—Lib. IV, Cap. 65, fol. 213 *et seq.*, *op. cit.*, p. 623, *supra*.

‡ CÆLIUS AURELIANUS—*Morb. Chron.*, Lib. IV, Cap. 6, p. 526, Ed. cited p. 664, *supra*—relates that DIOCLES, in his book *De Passionibus et earum Causis et Curationibus*, directed galls with opium among other remedies for the treatment of dysentery.

§ See, especially, *De Comp. Med. secundum Locos*, Lib. VII, Cap. 5, [Ed. Kühn, XIII, 88.] in which there are a number of such formulæ, generally described as "anodynes," and vaunted for their efficacy in dysentery and the cœliac flux, as well as in other disorders. Others will be found in Caps. 3 and 4 of the same book, and in Lib. IX, Cap. 5, same Vol. Many of them are professedly borrowed from the writings of his predecessors, whose names are given. As an example of their character I may cite the preparation called "Aster," Lib. VII, Cap. 5, p. 91: "℞ Croci obol. iij, seminis hyoscyami ʒvj, seminis apii ʒvj, anisi ʒiij, styracis ʒiiij, seminis dauci ʒiiij, castorii ʒij, opii ʒiij, myrrhæ ʒij. quidam etiam mandragoræ succi ʒiiij. ut vero Xenocrates, etiam piperis albi ʒvj, cum aqua fac pastillos triobolares. Dato ex aqua." I have already referred to GALEN'S account of those marvels of polypharmacy, the antidote of MITHRIDATES and the theriaca of ANDROMACHUS, (see notes to p. 730, *supra*,) which for centuries after his time were prescribed in the fluxes. Another compound, which shared in some degree this renown, was the antidote of PHILO, or Philonium, which PHILO described in a poem preserved by GALEN—Lib. IX, Cap. 4, p. 267 *et seq.*, volume cited. It contained opium, hyoscyamus, white pepper, crocus, &c. In various modified forms this preparation long survived in pharmacy. LEMERY—p. 422 *et seq.*, *op. cit.*, p. 729, *supra*—gives formulæ for several such compounds. Its use in dysentery is referred to by PISO, MERCURIALIS, SENNERTUS (see places cited in note †, next page) and other writers of the 16th and 17th centuries.

‖ ÆTIUS—Tetrab. III, Serm. I, Cap. 48, p. 609, Ed. cited p. 653, *supra*. ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 445 *et seq.*, and Cap. 9, p. 467 *et seq.*, Ed. cited p. 624, *supra*. PAULUS ÆGINETA—Lib. III, Cap. 42, Vol. I, p. 526, Ed. cited p. 624, *supra*.

¶ Yet CELSUS was well acquainted with opium, which he called lachrimæ papaveris, and did not hesitate to prescribe it in colic—see Lib. IV, Cap. 14, Vol. I, p. 295, Ed. cited p. 656, *supra*. GALEN—*Meth. Med.*, Lib. XII, Cap. I, [Ed. Kühn, X, 816.]—is exceedingly emphatic with regard to the indiscriminate use of anodyne remedies. (He specifies the juice of the poppy, hyoscyamus seeds, mandrake root and styrax.) These, he cries, who resort to these remedies at improper times or immoderately, jugulate the sick along with their pains. I have already referred to the evil consequences which GALEN attributed to the rash suppression of the dysenteric discharges: see note †, p. 411, *supra*. Similar sentiments were entertained by PHILUMENUS, in ÆTIUS—Tetrab. III, Serm. I, Cap. 35, p. 585, Ed. cited p. 656, *supra*: "Etenim obluctari et exercitionis cohibitionem mobri, majorem morbum facit: siquidem quæ cohibentur sursum perlata dolores capitis, aut phrenitidas, aut lethargos, aut parotidas inferunt plane perniciosos."

** ALEXANDER OF TRALLES—Lib. VIII, Cap. 8, p. 441, Ed. cited p. 621, *supra*.

Avicenna taught that, although the narcotics were sometimes necessary to relieve tenesmus or secure sleep, their use is dangerous: they should not be administered if it can be avoided, especially to patients who are cold or whose pulse indicates debility; their use by the rectum is preferable to giving them internally, and their external application still better; he knew a patient who died from the effects of a suppository of opium.* Later physicians were long impressed with the necessity of extreme caution as to the use of anodynes in dysentery, as may be seen from the writings of Savonarola, Altomarus, Nicolaus Piso, Mercurialis, Hildanus, Sennertus and Septalius.†

But a radical change in these views was brought about by the influence of the chemical school. The reputation of the specific anodyne or laudanum of Paracelsus led to its imitation by Quercetanus, Oswald Croll, Angelus Sala and other chemists, so that numerous laudanums, all rich in opium, soon came into common use in the treatment of painful affections, among others dysentery. Angelus Sala, especially, extolled their virtues in dysentery and other alvine fluxes, and sketched a plan of treatment, in which the early use of evacuants should be followed by subsequent reliance upon the preparations of opium, which closely resembles the method pursued by Sydenham.‡ A few years later we find Riverius declaring that narcotics administered by the mouth do wonders in dysentery; that they relieve pain, check the flux, produce sleep and thus strengthen the patient. Bontius

* Avicenna—Lib. III, Fen 16, Tract. 1, Cap. 4, p. 817, Ed. cited p. 632, *supra*—advised that the narcotics when administered internally should be combined with such stimulating drugs as castor, crocus and the like. His story of the unfortunate, mentioned in the text, is graphically told: "Et jam testati sumus nos vidisse, qui supposuit sibi collyrium ex opio, et mortuus fuit." After these cautions, however, he gives a number of formulæ for opium, hyoscyamus and other narcotics in combination with galls, myrrh, &c.

† Michael Savonarola—*Practica*, Tract. VI, Cap. 16, Rub. De dissinteria intestinali, Venetiis per Andream de Bonctis de Papia, X Maii, 1486, fol. 176 *et seq.* It has been remarked by Sprengel—Ed. II, S. 674, *op. cit.*, p. 346, *supra*—that he laid down very well the rules for giving opiates in dysentery, but I find him merely repeating with all docility the precautions insisted upon by Avicenna and Alexander of Tralles, especially the former. Altomarus—*loc. cit.*, p. 689, *supra*: "Quapropter medicamenta quæ ex opio, altercо, nigro papavere, aut mandragora componuntur, vitari omnino debent, nisi forte maxime urgeat necessitas, ex Tralliani sententia," &c. Nicolaus Piso—p. 277, *op. cit.*, p. 665, *supra*—repeats this language almost word for word. Mercurialis—*De Cog. et Cur. Hum. Corp. Affect.*; I cite the Venice Ed. of 1627, p. 380—remarked that stupefying remedies may be given if immoderate pain or wakefulness makes them necessary, but moderately, "quia sunt naturæ nostræ inimica." Equal caution with regard to the use of opium and other anodynes is observed by Hildanus—Cap. 9, p. 684 *et seq.*, *op. cit.*, p. 644, *supra*; Sennertus—T. III, p. 176, *op. cit.*, p. 645, *supra*; and Septalius—Lib. VII, § 100–101, p. 229, *op. cit.*, p. 680, *supra*. Yet Sennertus, notwithstanding his earnest cautions against the abuse of these remedies, admitted that opiates rightly administered are of great service, not merely relieving pain and producing sleep, but checking the flux—p. 175.

‡ I suppose Paracelsus was not very nice in the use of his word *laudanum*, and that at various times he bestowed it upon very different nostrums. I have already referred to one of these—see note ‖, p. 689, *supra*—of which antimony appears to have been the chief ingredient; and according to Sprengel—Bd. III, S. 500, *op. cit.*, p. 346, *supra*—that zealous disciple of Paracelsus, Adam von Bodenstein, claimed that his more famous laudanum was not an opiate but the quintessence of mercury. But according to Angelus Sala—*Opiologia*, The Hague, 1644, Cap. 8, p. 33—Paracelsus appears in a general way to have called any anodyne or comforting medicine laudanum, and the same writer bestowed the name *laudanum of Paracelsus* upon the "specific anodyne" described in his *Archidoxorum*, Lib. VII, T. II, p. 26, *op. cit.*, p. 336, *supra*, which was made by digesting Theban opium with the juice of citrons and pomegranates, cloves and cinnamon, and afterwards adding musk, saffron, &c. Various other laudanums were devised by subsequent chemists. Quercetanus—*Pharm. Dogmat. Restitut.*, (1609,) p. 218, Ed. cited p. 729, *supra*—modestly called his preparation *laudanum præstantissimum*, and among its uses declared that it was advantageous "contra omnes defluxiones et fluores ventris, dysentericos, hepaticos, lientericos, et similes." Oswald Croll—*Basilica Chymica*, (1609;) I cite the Geneva Ed., 1643, p. 199—used hyoscyamus as well as opium in the preparation of his laudanum, which he called the *laudanum Paracelsi laudatissimum*, but whether Paracelsus had anything to do with its composition seems doubtful. He described also an *electuarium laudani*, which contained extract of mandrake as well as hyoscyamus and opium—p. 210. Among other uses of these preparations Croll declared them beneficial "in omnibus profluviis intestinorum sive ratione humorum peccantium et mordentium, sive ratione humorum purgantium." Angelus Sala—p. 37, *op. cit.*—called his laudanum *nepenthes aurea*: it contained no hyoscyamus. Both he—p. 33—and Hartmann in a note to the work of Croll—p. 202—testify that almost every chemist had by this time a laudanum of his own; and the latter adds that for the most part all these preparations are imitated with trifling modifications from the specific anodyne of Paracelsus, who himself had besides this anodyne another laudanum, which was metallic, being made out of gold, and the composition of which remains unknown. Among the uses of the laudanums enumerated by Sala—Cap. 9, p. 43, *op. cit.*, *supra*—was "to arrest in a natural way hæmorrhages, the dysenteric flux, menorrhagia, as also diarrhœas and alvine fluxes proceeding from great intemperance of the internal heat or any acrid and irritating humor." Further on—p. 50—he adds that in dysenteries and severe fluxes without blood, the peccant matter should be evacuated with rhubarb or other suitable remedies, and then laudanum should be given with syrup of quinces as often as is necessary. As to the derivation of the word laudanum there has been much difference of opinion, and when we consider in how many cases the mingled ignorance and audacity of Paracelsus led him to make new words by mispronouncing or misspelling old ones, (*vide* Sprengel—Bd. III, S. 448, *op. cit.*—who instances, among other examples, the use by Paracelsus of *pagoyus* for *paganus*, of *undimia* for *wdema*, &c.,) we shall not feel very sure of any of the derivations which have been given. The older admirers of Paracelsus derived the word from *laus*: praise or supposed it to be an abbreviation of "*laudatum opiatum*." In the index of words peculiar to Paracelsus appended to the edition I cite—T. III, Appendix, p. 16—I read: "Laudanum Theophrasti Paracelsi, est medicina laude digna," &c. Oswald Croll—p. 211—explained it by the remark: "Laudabile medicamentum, quod plane suo nomini respondeat, si laudanum dicas." Even according to these friendly views the term is a barbaris a quite as much as if it be merely a distortion of the name ladanum, and intended to indicate that the nostrum on which it was bestowed partook of the virtues which, since the time of Galen, (vide *De simp. med. temp. ac fac.*, Lib. VII, Cap. 10, § 28, Ed. Kühn, XII, p. 28,) have been attributed to that plant. It has also been suggested that the word is a barbarous fusion of the French article *le* with the word *anodyna*, as though the attempt were imperfectly made to say *l'anodyna*; and the antagonists of the chemists insisted that it signified *lauda non*, because it deserved no praise. Authorities for these derivations are given by Mangetus—*Bibl. Pharm.-Med.*, Lib. XIV, T. II, Geneva, 1704, p. 501—from the *Opiologia* of Wedel: see note §, next page.

about the same time wrote of opium as indispensable in the dysentery of hot climates, and Rolfincius, a little later, bestowed the title of sacred anchor on the solid laudanum which he prescribed in two-grain doses to relieve tormina and tenesmus.* During the London dysentery of 1671 Willis gave his patients a full dose of liquid laudanum every evening, in some cases repeated it during the day, and affirmed that he had never known this practice to prove hurtful.† Sydenham used in like manner a liquid laudanum of his own device; after having bled and purged he administered a cathartic, which he followed by sixteen to eighteen drops of this preparation, and afterwards gave it in daily draughts. It was in connection with the account of this method that he wrote his well-known eulogy of opium as the chiefest gift of the Creator to the suffering human race.‡

From the time of Sydenham to the present day many physicians of reputation have relied upon this drug as the most important medicine in the treatment of dysentery. Wedel thought that genuine dysentery could not be conveniently cured without it; Ettmüller, that it is difficult if not impossible to cure the graver forms of the disease without its aid; Brunner spoke of it as a divine remedy, and Ramazzini expressed the opinion that there is no disorder in which opiates can be given more safely or in larger doses.§ It would be easy, if worth while, to add to the list of those enumerated in the work of Tralles‖ (1760)

* RIVERIUS—Lib. X, Cap. 6, p. 305, *op. cit.*, p. 680, *supra*—thought narcotics most useful when combined with astringents and corroborants. In his *Observationes*, Cent. II, Obs. 84, p. 510, *op. cit.*, he relates that he cured his own wife, who had been attacked by the dysentery prevailing in 1642, with a couple of two-grain doses of laudanum (see last note) followed a few days later by a laxative of myrobalans and rhubarb. BONTIUS—Lib. I, Cap. 4, p. 6, *op. cit.*, p. 681, *supra*—wrote: "Hoc saltem dico, si nobis hic de opio; ac opiatis non esset prospectum, frustra in calidissimis his regionibus medicinam faceremus, dysenteriæ," &c.; and he suggests that Mithridate, theriaca and Philonium owe their virtues merely to the opium they contain. In Lib. III, Cap. 3, p. 65, he extravagantly lauds the extractum croci in dysentery, a preparation which he states in the following chapter—p. 67—is composed of equal parts of the choicest opium, dragon's blood, gum benzoin and oriental crocus (saffron) mixed with a third part of ambergris, (ambræ Japonicæ seu nigræ.) Of this he says: "Putoque verissimum hujus morbi, sæpe etiam venenati, antidotum esse." ROLFINCIUS—Lib. III, Cap. 17, p. 300, *op. cit.*, p. 681, *supra:* "Sacra anchora est laudanum opiatum ad gr. ij. sumtum." I know not which of the solid laudanums it was he gave.

† WILLIS—Sect. III, Cap. 3, p. 79, *op. cit.*, p. 680, *supra*—in various other passages of this chapter mentions laudanum liquidum and laudanum liquidum cydoneatum, (*i. e.*, prepared with quinces,) so that I suppose him to mean liquid laudanum in that referred to in the text, although he only says "laudani dosin satis magnam." Formulæ for several varieties of liquid laudanum, as well as the preparation with quinces and Sydenham's laudanum (see next note) are given by QUINCY—Part II, p. 16 *et seq.*, *op. cit.*, p. 734, *supra*.

‡ SYDENHAM—Sect. IV, Chap. 3, Vol. I, p. 170, Transl. cited p. 407, *supra*—explained that he followed the cathartic by his liquid laudanum, because "it is clear that even the mildest laxative, mere ecoprotic medicines, increase the cramps of the belly, and cause both dejection of spirits and general disorders to the patient." If the disease did not yield, he gave it "every day, night and morning, until recovery; nay, frequently to make things doubly sure, I give it every eight hours, i. e. three times in the twenty-four; and that in a dose as large as five-and-twenty drops—provided that the previous doses have been insufficient." The following is the formula for this preparation: "Sherry wine, Oij; opium, 3ij; saffron, 3j; cinnamon in powder, cloves in powder, ãã 3j. Mix, and put into a vapour-bath, for two or three days, until the liquor become of a proper consistency. Strain, and lay by for use," p. 173. It was after giving this receipt that SYDENHAM wrote the eulogy of opium beginning, "And here I cannot but break out in praise of the great God, the Giver of all good things, who hath granted to the human race, as a comfort in their afflictions, no medicine of the value of opium, either in regard to the number of diseases that it can control, or its efficiency in extirpating them."

§ G. W. WEDEL—*Opiologia*, Jena, 1674. Our library does not yet possess a copy of this learned work, and I cite from the reprint of MANGETUS—T. II, p. 514, *op. cit.*, last page: "Sine opio nullam veram dysenteriam curari commode posse." He adds: "Bone Deus! vidimus in dysenteria, statim in principio 40, 50, 60 intra ♂♀, (incredibile dictu) ægros fuisse macerates, dejectosque sedibus. Dato convenienter opio, statim pacatiori rivo mali sentina effluxit." MICHAEL ETTMÜLLER—*Diss. de virtute opii diaphoretica*, (1679,) Cap. I, § 4, Diss. Academ., p. 186, Opera, Lyons, 1690: "Dysenteriæ graviori absque opio succurrere difficile, ne dicam impossibile est." See also *De Morb. Hum. Corporis in Genere*, Cap. IX, p. 126, *op. cit.*—where he cites the experience of RIVERIUS and others, and exclaims, "Inde etiam tot præstant exempla feliciter curatarum dysenteriarum per *sola opiata*;" yet adds that he does not advise them to be given alone in the beginning of the disease, but combined with sudorifics or even if necessary with gentle abstergents, such as rhubarb. Among the preparations of opium he praises the diascordium of FRACASTORIUS—see his *De contagionibus et contagiosis morbis*, (1546,) Lib. III, Cap. 7, fol. 142, Opera, Venice, 1555—a mixture of opium with scordium, (water germander,) whence its name, dittany, tormentil, bistort, galbanum, styrax, gentian, cinnamon, cassia, piper longus, ginger, Armenian bole, terra sigillata, &c. It was used in dysentery not merely by ETTMÜLLER and many of his predecessors, but after his time, especially on the Continent almost to the present day. The propriety of using it is gravely discussed by SAVIGNAC, who declares that it is neither better nor worse than theriaca. It will be found with but little modification in the French Codex of 1866, p. 502. J. CONRAD BRUNNER—*Experimentum in dysenteria*, Ephem. German., Dec. II, an. 6, 1687, Obs. 195, p. 391: "Incassum tamen laboratur, nisi opiata sæcenturientur, remedia plane divina in hoc morbo." B. RAMAZZINI—*De constitutionibus annorum* 1692, 1693 *et* 1694, § 33, Opera, London, 1717, p. 113: "Dysenteria porro, quas anno 1693 per autumnum peticulari febri supervenisse superius dixi, egregie controlisse opiatorum usum observavi; nec forsan ulla est affectio in qua securius, et liberaliori dosi exhiberi possit hoc remedii genus, quam in hujusmodi morbo, fractis licet, ac pene attritis viribus."

‖ B. L. TRALLES—*Usus Opii Salubris et Noxius in Morborum Medela*, Sect. III, Breslau, 1760, p. 172 *et seq.* Among the advocates of opium in dysentery referred to in this learned work that I have not been able to consult, I may mention J. J. WEPFER—*Diss. de dysenteria præcipue maligna quæ per æstatem et auctumnum 1712 in Cleria et vicinis regionibus grassata est*, Duisburg, 1713—who claimed to have cured six hundred cases with laudanum alone. To the authorities cited by TRALLES I will here only add CLEGHORN—Chap. 5, p. 254, *op. cit.*, p. 637, *supra*—who, after the administration of evacuants in the early stages of dysentery, found it "absolutely necessary to give opium twice a day, in order to obtain some respite from perpetual torment, and gradually to increase the dose, from half a grain to five or six, as use made it familiar." This was his main reliance, but "once or twice a week or oftener, as the strength would allow," he used also clysters, cathartics or small doses of ipecacuanha "to hinder the acrid matter from being accumulated in the intestines." He adds: "If by these means the patient can be kept alive during the first severe winter weather, he stands a good chance of holding out to the summer, which commonly restores him to his former health, when he must be weaned by degrees from the use of opium; from the continuance of which medicine, in such cases, I have never found any ill effects ensue."

as having placed their principal reliance upon its virtues; and many later physicians have rivalled their predecessors in extravagant praise.

Van Geuns administered opiates boldly during the Harlingen epidemic, regarded them as possessed of wonderful powers in resisting the tendency to gangrene, and cites a letter from Voltelen, who gave as much as twenty-four grains of opium in the twenty-four hours.* Vogler declared that opium is the best of all the measures devised against dysentery; he held that it should be administered freely, and as early in the disease as possible; out of more than a hundred patients thus treated during the Weilburg epidemic of 1791 not one died.† Richter, who had the opportunity to observe three considerable epidemics in the vicinity of Gottingen, also relied upon opium as the most important medicament.‡ Rademacher trusted chiefly to laudanum during the Cleves epidemics; he gave to one patient, a woman, twenty-five drops four times daily for three weeks.§ Chapman declared that without the aid of opium he should not know how to proceed in the treatment of dysentery.‖ Christison gave it in two- or three-grain doses during the Edinburgh epidemic of 1828, and asserted that in urgent cases it was sometimes necessary to give as much as twenty-four grains of opium in twenty-four hours.¶ Paterson advised that the treatment of dysentery should be commenced by the administration of a drachm and a half or two drachms of laudanum, and that subsequently six grains of powdered opium, with three of calomel and half a grain of tartar emetic, should be given every eight hours.** Bamberger taught that of all the medicines used internally in the treatment of dysentery, opium was that from which the most was to be expected in severe cases.††

The latest utterance of this kind comes from that skilful practitioner Austin Flint, who holds that our chief reliance, particularly in epidemic dysentery, should be placed upon opium; and in emphasizing the tolerance of this drug, sometimes observed, relates that he gave to one patient suffering with this form of the disease no less than twenty-four grains

* VAN GEUNS—S. 29 *et seq.*, *op. cit.*, p. 649, *supra*—in the Harlingen epidemic gave an emetic of ipecacuanha, with or without tartar emetic, and followed its operation with opiates. In severe cases he gave as much as 40 to 60 drops or more of liquid laudanum—S. 54—or 8 to 12 grains of solid laudanum—S. 61. So far was he from admitting that opium produced a tendency to gangrene, *(vide infra,)* he held that it acted in a wonderful manner in preventing this dreaded complication—S. 57. He quotes with approval a letter from HOFF, who wrote that "opium is the great medicine, but it must be given in sufficient doses; small doses are of no avail"—S. 60; and a letter from F. J. VOLTELEN, who advocated the use of solid opium, and while taking credit to himself for not giving such large doses as STINSTRA and LENZIUS, admitted that he once gave 24 grains in the 24 hours. I note that according to HAUFF—S. 406, *op. cit.*, p. 534, *supra*—VAN GEUNS himself gave as much as a drachm of opium daily, which appears to be a misunderstanding; I suppose a case to be referred to—S. 86—in which he gave a drachm of liquid laudanum daily for eight days.

† J. P. VOGLER—*Von der Ruhr und ihrer Heilart*, Giessen, 1797, Kap. 7, S. 158 *et seq.* The statement with regard to the Weilburg epidemic will be found on S. 173; but he admitted that opiates are sometimes contraindicated, (see Kap. 8, S. 203 *et seq.,)* and held that it should not be given in excessive doses, or too long continued. The dose of solid opium or its extract should not exceed two-thirds of a grain—S. 198. This work appears to have exercised considerable influence in extending the employment of opium in dysentery among subsequent German practitioners.

‡ RICHTER—S. 86 *et seq.*, *op. cit.*, p. 731, *supra*—stated that he believed with AKENSIDE, STOLL and VOGLER, that dysentery does not depend upon bilious, corrupt accumulations in the intestinal canal, but that it is a catarrhal or rheumatic affection of the intestine; and he held that it cannot be cured by purgatives or emetics, but that the proper remedies are sedatives (reitzstillende Mittel) and diaphoretics. He, indeed, gave emetics, and combined antimony with opium as a diaphoretic, but he declared "Mohnsaft war das Hauptmittel," and added with ingenious sophistry: "Schmerzen sind beynahe das einzige Symptom der Krankheit; schmerzlindern das einzige Geschäfte des Arztes. Tormina nennten die Alten die Krankheit," S. 101.

§ RADEMACHER—p. 79 *et seq.*, *op. cit.*, p. 734, *supra*. The years referred to in this treatise are especially 1795, 1796, 1800 and 1802. The case mentioned in the text occurred during the first of these years; it is related in a communication to Hufeland's Journal, Bd. II, 1796, S. 600: see also, in the same Journal, Bd. IV, 1797, S. 554, an essay by the same author, "*Ueber die Ruhr, welche im Jahre* 1796 *zu Cleve herrschte.*"

‖ N. CHAPMAN—*Elements of Therapeutics and Materia Medica*, Vol. II, Philadelphia, 1819, p. 208: "Even by Cullen the use of opium in dysentery is condemned, and he is not alone in this respect, though surely he is wrong, or there is a strange delusion on the subject. Consulting my experience, I must say, that in dysentery opium cannot be dispensed with. Deprived of its aid, I should really not know how to proceed in the treatment of the disease:" see also subsequent editions, including the 4th Ed., Philadelphia, 1825, Vol. II, p. 179.

¶ ROBERT CHRISTISON—*Notice on the dysentery which has been lately prevalent in the Edinburgh infirmary*, Edin. Med. and Surg. Jour., Vol. XXXI, 1829, p. 216—summed up his treatment by remarking that it "consisted at the commencement in the liberal use of opium, preceded in some instances by the free application of leeches to the lower part of the belly, and frequently accompanied with the application of large blisters, and with the use of the warm-bath:" see also the same author, *On the employment of opium for arresting acute internal inflammations*, London and Edinburgh Monthly Journal of Med. Sci., Vol. I, 1841, p. 92.

** A. PATERSON—*Obs. on the pathology and treatment of dysentery*, Lond. Med. Gazette, Vol. XIII, 1834, p. 200—remarks: "By this simple plan, and with no addition except what the urgency of any particular symptom demanded, I have been enabled to cure every case of dysentery that has come under my care in a much shorter period, and with greater ease to the patient, than could have possibly been the case if either the mercurial or the cathartic mode of treatment had been followed."

†† BAMBERGER—S. 410 u. 417, *op. cit.*, p. 578, *supra*.

of the sulphate of morphia in the twenty-four hours, for several days; a quantity which throws the older observations just cited quite into the shade.*

But these extravagant views encountered equally extravagant opposition from the very first. As early as the beginning of the seventeenth century Minadous observed foul ulcers in the intestines of patients dead of dysentery after the fruitless use of opium, and expressed the opinion that the retention of acrid humors produced by the drug had caused them to become more putrid than they would otherwise have been. This view was advocated by Thoner, (1651,) whose aphorism, "Narcotica in dysenteria esse necrotica," was long accepted in many quarters.† Frid. Hoffmann adopted it at least for the beginning of the disease, during which, he taught, the stronger opiates and astringents should be carefully avoided lest the inflammation be converted into a fatal sphacelus. To restrain the excessive intestinal motion or spasm he preferred milder anodynes, especially his own anodyne liquor, and rather than advise opium he even sanctioned with his authority the use of various ridiculous animal substances, which the superstition of former ages had introduced into the treatment of dysentery and endowed with imaginary anodyne virtues.‡

To these earlier protests must be added the prudent warnings of many later physicians, especially those who have had the opportunity to study epidemics of severe dysentery. Degner§ held that the use of narcotics and opiates should be regarded with suspicion, affirmed that observation showed their use too early in the disease, or in too large doses, to produce doubtful or even fatal results, and thought them apt to lull both patient and physician into a false security: only after the free use of evacuants did he prescribe mild anodynes, and then with the greatest caution. Very similar were the opinions maintained by Young, Pringle, Tissot, Eller, Baker and Zimmermann.‖ They all regarded the employ-

* AUSTIN FLINT—*op. cit.*, note ‡, p. 703, *supra*—strongly commends opiates in certain sporadic cases also in this lecture. With regard to epidemic dysentery he says: "So far as medical treatment is concerned, our chief reliance must be placed upon opium. Administer opium early and persistently, and to the extent of absolutely quieting the intestines, but at the same time avoiding the risk of narcotism." He adds, "that, in certain cases at least, there is a wonderfully increased tolerance of opium. For example, I have given a patient, suffering from epidemic dysentery, a grain of the sulphate of morphia every hour—24 grs. per diem—and continued such doses for several days without producing the least manifestation of narcotism; and the patient was a person not accustomed to taking opium. That was an extraordinary case, it is true, but I have been repeatedly led to observe a greatly increased tolerance of opium in this class of cases." This commendation of such dangerous practice by a physician whose opinions are deservedly so much esteemed, makes it a duty to point out that, of twenty-six cases enumerated by him in his *Clinical report on dysentery* (cited p. 710, *supra*) as treated chiefly or exclusively by opium and its preparations, six died, while of ten cases which the same author permitted to run their course without treatment—see note ‡, p. 349, *supra*—all terminated in recovery. It may be reasonably objected that this application of the "statistical method" is hardly fair in the absence of definite information as to the relative severity of the two groups of cases, but this criticism will also apply to the method employed by our author in his "clinical report," and to all the deductions it contains. I may add that of 23 other cases enumerated in this report as having been treated chiefly with calomel and opium, five died.

† JOHN THOMAS MINADOUS, according to MANGETUS—T. II, Pars I, p. 338, *op. cit.*, p. 710, *supra*—was appointed professor in Padua in 1596, and died in 1615. MANGETUS gives a list of his writings, none of which I have seen. I take the statement in the text from A. THONER—*Obs. Med.*, Ulm, 1651, Lib. III, Obs. 8, p. 167. In this observation, headed "Narcotica in dysenteria esse Necrotica illustri exemplo ostenditur," after relating the case of a certain count who took opium (aliquot granis laudani opiati) for dysentery, became stertorous, and died, he adds: "Exin Thomas Minadous, Medicus et Professor Italus, se observasse asserit, omnes dysentericos, quibus ex consilio Medicorum laudanum opiatum oblatum, defunctos: post eorum usum, ulcera magis putrida et sordidiora reddita, ex longiori mora materiæ purulentæ, et aeriorum humorum." We have the testimony of B. L. TRALLES—Sect. III, p. 177, *op. cit.*, p. 737, *supra*—that these views were shared by many subsequent physicians, (recentiorum sat multi.) See also the references to HOFFMANN and DEGNER, *infra*.

‡ HOFFMANN—T. III, p. 155, *op. cit.*, p. 681, *supra*—admitted, as his second indication for the treatment of dysentery, to soothe tormina and spasms of the intestines. This, he says, should be done with the "safer anodynes and milder substringents." He says that theriaca, aqua theriacalis, diascordium, pills of cynoglossus, (which contained opium,) the liquid laudanum of Sydenham, &c., are commonly used, but it is far safer to give his anodyne liquor mixed with moderate doses of his balsam of life. In the cautelæ et monita appended to this chapter, § 1, p. 157, he expressly asserts that the stronger opiates (crassa opiata) and astringents, if given in the beginning of the disease, cause the retention of the caustic humors, and if the strength of the patient is broken, readily act as "necrotica," and convert the inflammation into fatal sphacelus. In § 2 he commends the safe anodyne virtues of the spines and livers of vipers, scrapings of the teeth of the hippopotamus, the bones of the sea-cow, the penis of the whale and dried human secundines.

§ DEGNER—Cap. III, § 70, p. 180 *et seq.*, *op. cit.*, p. 625, *supra*. Among the anodynes, he mentions pills of cynoglossus, syrup of white poppies, diascordium and theriaca; but he adds that even the syrup of poppies and theriaca are not sufficiently safe, and in a foot note—p. 184—says of soporific remedies: "Hinc antiquis æque ac recentioribus medicis semper suspecta fuerunt, qui jam din clamarunt: in hoc morbo narcotica esse necrotica."

‖ GEORGE YOUNG—*A Treatise on Opium*, London, 1753, Sect. VII, p. 47 *et seq.*—wrote: "For my own part, when I reflect how commonly opium is used in this disease, without any caution, I suspect its effects are too often fatal." He held that in plethoric patients if the stools are fetid, viscid and scanty, opium will certainly increase the disorder, and remarked: "I use opium only when the disease is mild, or after its violence is abated by evacuants and emollients." If the dysentery be attended with a fever, he thought opiates still more prejudicial. Sometimes, however, he combined opiates and purgatives with advantage. The same physician, in his account of cerated glass of antimony, published by PRINGLE—p. 199, *op. cit.*, p. 690, *supra*—wrote: "I never chuse to give opiats in the beginning, especially where there is great sickness; because although opium gives great relief to some, yet

ment of opiates at the beginning of the disease as dangerous, and counseled caution as to their use in the more advanced stages. Pringle felt so strongly on the subject that he emphatically declared it were better opiates were never used at all than given before the first passages were thoroughly cleansed.

Cullen maintained that opium is at best a precarious remedy in dysentery, to be avoided as much as possible.* Hufeland cautioned against using it, especially in the bilious forms of the disease, in which he thought there was the greatest danger to be apprehended from the suppression of the discharges.† Twining held the idea of curing the serious lesions of grave dysentery by the use of opium in great contempt, and affirmed that he had seen it prove exceedingly injurious by masking the deadly symptoms until the patient was past recovery.‡ Berndt, who treated numerous cases of mild dysentery with opium in his early practice, states that, although many of them recovered, many others were certainly injured by this mode of treatment.§ Canstatt, while he admitted the power of opium in temporarily relieving the painful symptoms of dysentery, thought that it is so apt to do mischief, by causing the retention of acrid matters in the intestinal canal and increasing the tendency to adynamia, that it is best to use it very sparingly.‖ Trousseau only mentioned opium, in connection with dysentery, in order to raise his voice against the deplorable abuse of the remedy too often witnessed.¶ Savignac believed that opium ought not to dominate in the treatment of dysentery, but should be confined to the modest role

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at other times I have thought both the sickness and purging thereby increased the following day." PRINGLE—p. 282, 1st Ed., 1752, cited p. 693, *supra*—gives as a reason, "For, tho' they afford some ease; yet, by penning up the wind and corrupted humours, they fix the cause." He refers to the opinion of SYDENHAM, and remarks: "But, whatever was the nature of those fluxes, I am well assured, that these incident to an army are of a less gentle nature, and never to be cured without evacuations. The best rule, therefore, is to withhold opium till the patient is both vomited and purged; and when it becomes necessary, to begin with small doses." These views are repeated on pp. 263–4 of his 7th Ed., 1774, cited p. 640, *supra*. In this edition will also be found—p. 268—an observation which appears already in the 4th Ed., 1764, p. 277: "After clearing the first passages, in the manner described above, I have generally endeavoured to finish the cure, by combining purges with opiates, in such a manner as to keep the body open, and at the same time to appease the gripes: but I have not always succeeded to my wish." TISSOT—T. III, p. 18, *op. cit.*, p. 625, *supra*—speaks of the plan of trying to check the discharges in dysentery by opium and astringents as "méthode mortelle." J. T. ELLER—*Obs. de Cog. et Cur. Morbis præsertim Acutis*, Leipsic, 1762, Sect. XIII, De dysenteriis, et in specie de dysenteria epidemica, p. 273—held that the relief of pain afforded by the use of opiates was brief, that it debilitated the tone of the intestinal fibres, and actually made the disease worse. BAKER—p. 31 *et seq.*, *op. cit.*, p. 437, *supra*—thought that it was dangerous to give opiates before the stools reacquired the fæcal character, and that until then they should be administered sparingly or not at all. ZIMMERMANN—Cap. V, S. 96, *op. cit.*, p. 648, *supra*—always looked upon it as dangerous to give opium in dysentery before the acrid humors were got rid of, (eh der Zunder des Uebels zernichtet ist.) After their thorough evacuation he sometimes obtained benefit from liquid laudanum; but without rhubarb, given at intervals between the doses, or just after them, it was evidently injurious—S. 99. In Cap. 10, S. 413 *et seq.*, he recites the opinions of DEGNER, PRINGLE, BAKER and others who have cautioned against the early use of opium, and remarks: "All these prudential rules agree with those which my own experience has taught me"—S. 418. I may mention here the dissertation of D. G. BRÜNING—*Ueber die Schädlichkeit des Mohnsaftes in der Ruhr*, Gera, 1794—which I regret that I have not been able to see, as it is frequently quoted by subsequent writers.

* CULLEN—*A Treatise of the Materia Medica*, Edinburgh, 1789, Vol. II, p. 244: "If I am right in the pathology I have elsewhere endeavoured to establish, it will be obvious, that if the present practice of the frequent use of gentle laxatives be the most effectual measure, it will be equally evident that opiates must be commonly hurtful; and notwithstanding the urgency of pain, it is at best a very precarious remedy, and to be avoided as much as possible." In his *First Lines*, § 1083, Vol. II, p. 325, Ed. cited p. 648, *supra*, he admits that opiates "are very effectual for the purpose of relieving from the gripes;" but adds: "I believe it indeed to be only the neglect of purging that renders the use of opiates very necessary."

† HUFELAND—*Bemerk. über die im Herbst* 1795 *in und bey Jena ausgebrochne Ruhrepidemie*, Hufeland's Jour., Bd. I, St. 1, 1795, S. 76 *et seq.*—recognized a simple or rheumatic dysentery, a gastric or bilious dysentery, a form characterized by inflammatory complications, and one in which putrid complications occurred. Opium, he held, increases the force of the pulse, the turgescence of the blood and the temperature—S. 126. He, therefore, preferred extract of nux vomica, which he used also as a narcotic, except when the perspiration was suppressed, when opium may be used on account of its diaphoretic virtues; but either remedy, if given in bilious dysentery—S. 135—may produce dangerous consequences by checking the discharges and giving rise to what he called "gestopfte Ruhr;" it is even possible by large doses of narcotics to paralyze the intestinal canal—S. 136.

‡ TWINING—Vol. I, p. 72, *op. cit.*, p. 608, *supra:* "When we remember the actual condition of the local disease, which is to be removed before we can cure the severer forms of acute dysentery; we shall hold opiates in great contempt," &c. But "although opium has no direct effect in curing the acute inflammation existing in recent cases of dysentery," he thought, however, that enemata of laudanum were of great service in "procuring a temporary respite from pain and restlessness."

§ BERNDT—Hefte 3 u. 4, S. 227, *op. cit.*, p. 717, *supra:* "Ich selbst habe in früheren Zeiten das Opium als Heilmittel bei der Ruhr angewendet und manchen Kranken damit geheilt. Indessen muss ich doch der Wahrheit getreu bekennen, dass beim Gebrauch des Opiums der Regel nach eine langsame Heilung erfolgt ist, und dass ich viele Fälle beobachtet habe, wo es ganz offenbar Nachtheil gebracht hat."

‖ C. CANSTATT—Bd. I, S. 524, *op. cit.*, p. 717, *supra*. He charges opium with producing a semi-paralytic condition (Halblähmung) of the muscular coat of the intestines, thinks that the retained putrid matters may not only act locally as irritants capable of increasing the intestinal inflammation, but may be reabsorbed and increase the toxic condition of the bloodmass, (steigern die Toxicose der Säftemasse,) and thinks that on the whole the practitioner who uses it sparingly will do much better than he who employs it lavishly.

¶ TROUSSEAU—T. III, p. 170, *op. cit.*, p. 664, *supra:* "Je n'ai à vous en parler que pour m'élever contre les déplorables abus que l'on en fait encore trop souvent." If it is sometimes indicated, he says, it is only to relieve the accompanying pain, or arrest the vomiting that prevents the use of other remedies, and not to combat the dysenteric flux. So cautious was he that he advised the practitioner to commence even in these cases with a single drop of the laudanum of Sydenham every hour, and declares that if large doses be employed there is danger that grave typhoid symptoms will ensue.

of a mere adjuvant;* and Heubner disapproved of the methodical use of opium in this disease, advising that it should only be given temporarily and as a palliative remedy.†

It is not surprising that the extreme divergence of the two groups of opinions just sketched should have given rise to doubts and perplexities in many minds, or that the sentiment of the celebrated George Ernest Stahl, who was usually dogmatic enough, but who confessed that he was not prepared either to blame or to praise the use of opium,‡ should have found an echo in many minds. But notwithstanding all doubt or opposition, it has continued to be pretty freely employed in combination with other remedies even by those who did not trust it as directly curative. Indeed many of those whose objections have been cited in these pages have themselves employed it, though for the most part with commendable caution, while others have been much more liberal in its use.

Boerhaave and Van Swieten favored the plan of resorting to opium after the irritating acrimony from which dysentery originates has been expelled by emetics, purges and clysters.§ Donald Monro, although very sparing of the dose in the first stage of the disease, gave even then an opiate at night, and later in the disease administered astringents mixed with opium; in chronic dysentery he regarded its free use as indispensable.‖ Even Stoll, who laid such stress on the employment of emeto-cathartics in the early stages of dysentery, resorted to opium without hesitation in the subsequent treatment.¶ Hunter adopted a similar course.** Moseley, though he could not help expressing his concern at the continuance in army and navy practice of the custom of giving large doses of opium at night, did not hesitate to administer it, combined with his favorite diaphoretics, as he thought occasion required; observing that its real use is to arrest the hurry of the disease as well as to ease the tormina, and that when given for these purposes its matchless power is

* SAVIGNAC—p. 375 *et seq.*, *op. cit.*, p. 620, *supra*—cautions his readers against being misled by "marvellous recitals of cures due to the preponderating or exclusive employment of opium." Its principal use is to calm the violence of the tormina and tenesmus and to facilitate the action of other medicines, as, for example, purgatives, or, in the chronic forms of the disease, astringents.

† HEUBNER—S. 544, *op. cit.*, p. 529, *supra*—remarks, moreover, that it is impossible, with opium or morphia, to keep the bowels at rest all the time. The colic and tenesmus are moderated only for a while, and then in spite of large doses become more violent than before; besides, the state of stupefaction and heat into which the patient is brought by opium is decidedly unfavorable in dysentery.

‡ J. H. HEILERSIEG—*Diss. de dysenteria*, Halle, 1706, p. 32. This dissertation, prepared under the presidency of STAHL, confessedly represents his views. The author writes: "Opiatorum usum, ut alias non tam ex hypothesi, quam potius praxi, D. D. Praesidis, non facile, nunquam vero absolute sine summa cautione, suadendum esse putamus; ita etiam in hoc casu, non quidem damnamus, sed neque laudamus." He goes on to say that opium is unable to cure any disease, it only obtunds symptoms, and indeed not the symptoms, but only the sensation of them, and more rarely the motion accompanying them, and ends by advising that if opium be used, theriaca or pills of cynoglossus should be preferred. The ambiguous position of STAHL in this matter has been sharply criticised by WERLHOF—*Caut. med. sive diss. de limitandis morborum vituperiis et laudibus medelarum*, Tract. I, § 4, Opera Medica, Pars II, Hanover, 1775, p. 339; and TRALLES—Sect. III, p. 181, *op. cit.*, p. 737, *supra*.

§ VAN SWIETEN—§ 722, T. II, p. 393, *op. cit.*, p. 663, *supra*. The object assigned by BOERHAAVE in the aphorism here under discussion is "paucitione impetus [sel. acris irritantis] per narcotica." Elsewhere BOERHAAVE—*Consult. Med.*, Gottingen, 1752, Vol. II, Casus 6, p. 22, Responsio consultatoria circa dysenterias castrenses, imperatoris Romani exercitus devastantes—counselled that the treatment should be begun with an emetic of antimonial wine repeated daily for three days, or a daily purge (of rhubarb, myrobalans and scammony) repeated as often, followed ten hours later by two grains of opium, and after the venom was thus expelled he gave a mixture of Armenian bole, catechu, theriaca, &c.

‖ DONALD MONRO—p. 75 *et seq.*, *op. cit.*, p. 625, *supra*—also gave opiates sometimes in the daytime "between the purges," but usually only Mithridate with Mindererl draughts, or saline draughts with the addition of four drops of the tincture of Thebaica, or some such mild diaphoretic, and thought this better than to give "the Diascord, or Philonium, or other strong astringents and opiates commonly prescribed for this purpose; which were always liable to check the purging too much, and bring on severe gripes attended with heat and fever; and therefore we seldom made use of them in this first stage of the disorder." But, "after some weeks when the fever had abated," he used "corroboratiog and gentle astringent medicines, mixed with opiates,"—p. 79—such as the mixtura Fracastorii, repeated doses of the Philonium Londinense, the Theriac anodyne boluses, &c.—p. 82—or in other cases from three to ten grains of ipecacuanha with one of opium every four or six hoers, or Dover's powder in one- or two-scruple doses—p. 84. In his later work—Vol. I, p. 349 *et seq.*—he expresses the opinion that opium had better be omitted altogether for the first twelve or fourteen days, that afterwards mild opiate and diaphoretic medicioes be given in the intervals, but not to the extent of stopping the discharges, and "that in old dysenteries where the disorder has become in a manner chronic, the free use of opium is often absolutely necessary."

¶ STOLL—Cap. 2, p. 252, *op. cit.*, p. 342, *supra*—cured the simple rheumatismal dysentery of 1778 by tepid emollient drinks with powdered nutmeg and a little opium at bedtime. He formally defends SYDENHAM ("quem virum, et quantum!") from the charge of having made too much use of opium, pointing out that he did not employ that treatment in all varieties of dysentery—p. 254. In bilious dysentery (rheumatico-biliosa) STOLL gave an emetic or an emeto-cathartic, and this usually cured the disease without subsequent resort to narcotics. This form of dysentery, he thinks, it was that SYDENHAM cured with repeated purges followed by laudanum—p. 259—and he himself gave without hesitation the nepenthes of Helen (a kind of laudanum) after the action of the emeto-cathartic in these cases—p. 267. In the dysenteric bilious fever, however, he thought that opium should be given more sparingly, and later in the disease. So confident was STOLL in the efficiency of his plan of treatment that he declared that there is hardly any disease, among those which are called epidemic, so easily cured at the beginning, or that being neglected is so devastating in its effects—Cap. 7, p. 321.

** HUNTER—p. 239 *et seq.*, *op. cit.*, p. 637, *supra*—sometimes combined opiates with the purgatives, but generally preferred to use them alternately.

worthy of admiration.* Fournier and Vaidy commended the liberal employment of opium after the use of evacuants. Broussais gave it in both acute and chronic dysentery.†

Almost all the physicians who, in the latter part of the last and during the present century, have placed their main reliance on repeated doses of calomel, as well as those who have employed ipecacuanha for its diaphoretic action, or on the so-called non-emetic plan, have combined opium with these remedies, and often so freely as to give rise to the allegation that it was, after all, to the opium thus employed that the success of their medication was due.‡ In like manner those who have made free use of astringents, whether during the progress of acute dysentery or in the chronic forms of the disease, have usually conjoined opium with them, and often in considerable doses. It is not necessary to bring forward here the long list of those who have pursued these methods: the combinations with astringents will be discussed further on; those with calomel and ipecacuanha have already received sufficient attention. Let it suffice, at present, to refer to the works of Naumann, Hauff, Baly, Copland, Vogt, Morehead, G. B. Wood, Niemeyer and Barrallier,§ for illustrations of the liberal manner in which opiates have been employed in the treatment of dysentery by some of the most respected practitioners of medicine who have flourished during the last forty years. Since the discovery of morphia,‖ the salts of that alkaloid have been very frequently substituted for the other preparations of opium, and as early as the Wurtemberg epidemic of 1834 its endermic application began to attract attention.¶

At the commencement of our civil war the teachings of George B. Wood, who regarded opium as an invaluable remedy in dysentery, and combined it at almost every stage of the disease with the other medicines employed, were widely accepted by American practitioners; not a few shared the warm admiration with which Austin Flint regarded the use of the drug; while in the tract of Stillé,** although judicious prominence was given to ipecacuanha,

* Moseley—pp. 230, 237 and 239, *op. cit.*, p. 648, *supra*.

† Fournier et Vaidy—p. 380 *et seq.*, *op. cit.*, p. 362, *supra*. They regard it as very injurious, however, in the early stages of bilious dysentery—p. 396—and in dysentery complicated with typhus—p. 397. Broussais—T. III, p. 216, *op. cit.*, p. 643, *supra*—gave the laudanum of Sydenham or the syrup of opium in acute dysentery to relieve severe tenesmus and tormina, and made it the most important part of the treatment of chronic enteritis: "Les médicamens qui peuvent concourir, avec le régime, à la cure des phlogoses chroniques de la membrane muqueuse du colon, se réduisent, pour moi, à quelques stomachiques et aux anodyns"—p. 224. But he prescribed them with a sparing hand at first, not exceeding twelve drops of Sydenham's laudanum, or half a grain of opium, given at night; afterwards, if necessary, increasing the dose to 50 or 60 drops of the laudanum.

‡ For example, see the comments of Bamberger with regard to the diaphoretic use of ipecacuanha, referred to on p. 694, *supra*.

§ Naumann—Bd. IV, Abth. 2, S. 85 *et seq.*, *op. cit.*, p. 645, *supra;* Hauff—S. 404 *et seq.*, *op. cit.*, p. 534, *supra;* Baly—p. 535, *op. cit.*, p. 535, *supra;* Copland—Vol. I, p. 728, *op. cit.*, p. 682, *supra;* Vogt—S. 183, *op. cit.*, p. 645, *supra;* Morehead—p. 302, *op. cit.*, p. 657, *supra;* G. B. Wood—Vol. I, p. 721, *op. cit.*, p. 671, *supra;* Niemeyer—Bd. II, S. 755, *op. cit.*, p. 645, *supra;* and Barrallier—p. 771, *op. cit.*, p. 603, *supra*. In striking contrast to the reserve with which the use of opium was regarded by Heubner—see note †, p. 741, *supra*—is the freedom with which it was prescribed by Franz Seitz—No. 7, 1872, S. 84, *op. cit.*, p. 651, *supra*—who combined it with the demulcent or albuminous drinks, on which he placed his main reliance in the early stages of the disease, as well as with the astringents he gave at a later period. I note that Seitz was so cautious with regard to the use of laxatives in dysentery that he only recommended them in cases in which the fæcal accumulation can be recognized by palpation and percussion.

‖ By Sertürner, 1816—see the *Pharmacographia*, p. 53 *et seq.*, Ed. cited p. 704, *supra*—who called it morphium.

¶ Hauff—S. 408, *op. cit.*, p. 534, *supra*—remarks that opium has been used "neuerdings auch als Morphium, welches man auch endermisch anzuwenden versucht hat (Rampold)."

** Wood—*loc. cit.*, note §, *supra;* Austin Flint—note *, p. 739, *supra;* Stillé—*op. cit.*, p. 650, *supra*—in the treatment of "mild dysentery," advises, after a cathartic of calomel followed by castor oil, "a small opiate draught," or from 5 to 10 grains of Dover's powder, "to promote rather than to enforce sleep, to allay tenesmus, and moderate the frequency of the stools." If the disease continues, he gives "purges every second day, and the mild opiates at night, until the tormina and tenesmus have ceased, or nearly so," and then pills of acetate of lead or nitrate of silver with ¼th of a grain of opium every four or six hours—p. 362. In "sthenic or inflammatory dysentery" he advises the administration of 3 to 5 grains of Dover's powder, every three hours, between the "courses" of saline laxatives he commends for robust patients—p. 364; or when calomel is given, that a grain of opium be combined with each dose, and subsequently "the remainder of the medical treatment may in general be confined to five-grain doses of Dover's powder every five or six hours, or from three to five grains of ipecacuanha, with half a grain or a grain of opium at like intervals"—p. 365. Enemata of laudanum are commended in this form of the disease on p. 366, and acetate of lead and opium pills on p. 367. In "bilious dysentery," the premature exhibition of opiates is to be sedulously avoided; "but when once bilious evacuations have been procured, the administration of small doses of wine of opium or of Dover's powder may be cautiously resorted to for allaying pain and lessening the discharges"—p. 371. In "malignant or typhoid dysentery," although opium should be given with caution, yet it is perhaps the only medicinal substance, besides nitrate of silver, which is appropriate for internal use—p. 375. In "periodical dysentery" opiates are to be combined with quinia—p. 377; and in "chronic dysentery" with the mineral astringents—p. 378. In his *Therapeutics*, Vol. I, p. 870, Ed. cited p. 711, *supra*, our author writes: "In mild attacks of dysentery there is no doubt that opium alone, or that purging alone, will effect a cure, but it is equally certain that rest, diet, diluent drinks, and emollient clysters will have the same effect; but, when the disease is severe, no exclusive plan can be relied upon, and least of all, perhaps, that by opium." Nevertheless, after the violence of the malady has been broken by emetics, laxatives or diaphoretics, he thinks that opium should be employed, alternating with them, or following them, for the purpose of "perfecting the cure," and he holds that "chronic dysentery is materially benefited by opiates."

the neutral salts and other evacuants, opiates were commended, for the most part however in moderate doses, in every form of the disease.

Tripler, instructed by a military service of over thirty years, which included the arduous Mexican campaigns, was far more careful in this direction. He not merely regarded opiates as well as astringents as worse than useless at the beginning of the treatment, but prescribed them in the subsequent stages in the most sparing manner, and even went so far as to throw doubts on the usefulness of anodyne enemata.* On account of his prominent position as Medical Director of the Army of the Potomac, his views became generally known and secured a considerable number of followers; but it is safe to say that the partisans of opium were very much in the majority. Those who began the treatment with saline cathartics or other evacuants very often followed their operation by full doses of opium. Indeed some laudanum or other opiate was frequently added to the first cathartics administered. Those who gave repeated doses of calomel, blue pill or mercury with chalk, whether with or without ipecacuanha, almost invariably added some preparation of opium to the pills or powders. The vegetable or mineral astringents, employed during the later stages of acute dysentery, as well as the mineral acids which some preferred, were generally combined with some preparation of opium; and if quinia was resorted to in cases that presented evidences of periodicity, it was usually fortified with opium.

This liberal use of the drug was not confined to cases of dysentery, but was extended to the other forms of flux.† When ordinary attacks of acute diarrhœa were treated at first with purgatives, these were generally followed with opiates either alone or combined with astringents. Indeed the practice of suppressing or attempting to suppress such attacks at the very beginning with diarrhœa mixtures, in which considerable quantities of opium were united with various astringents, aromatics and cretaceous preparations, was only too frequently resorted to in certain quarters. So, too, in the chronic fluxes undoubtedly the majority of medical officers united opium with almost every medicine employed to check the progress of the disease, and in spite of the sad experience of failure, which became more and more universal as the war progressed, continued to make use of it, though with ever-diminishing hopes of success, "as the drug which at least alleviated, if it did not cure."‡

* TRIPLER—p. 33, *op. cit.*, p. 691, *supra:* "Opiates and astringents, in the beginning of the treatment, are worse than useless. They cause the loss of valuable time, lull one into a false security, aggravate the congestion already existing, and frequently convert a perfectly manageable disturbance of the economy into a formidable and intractable disease." As to anodyne enemata, he remarks: "I cannot say that I have seen any decided benefit from them"—p. 34. He admits, indeed, the use of "a few grains of Dover's powder," after the use of his saline mixture, to procure sleep if the patient is restless; and when there is much symptomatic fever, with dry skin, he sometimes used small doses of Dover's powder to determine to the surface, but only after the preliminary evacuations. When after the subsidence of the fever the disorder assumed a chronic form, if the bloody mucous discharges continued, he was fond of Hope's camphor mixture, and sometimes added a few drops of laudanum, "half a drachm, or less," to the enemata employed; but he did not recommend the internal use of opiates in chronic dysentery.

† See, in illustration of the use of opiates in the various forms of flux during the war, the reports, in Section II. of STORROW—p. 43, *supra;* SCHÜSSLER—p. 44; PENROSE—p. 45; WOODWARD—p. 51; WRIGHT—p. 62; COUES—p. 64; HOLSTON—p. 66; BELLOWS, SCHELL and WHITTINGHAM—p. 70; LEE—p. 71; HOUGH—p. 75; BLAKESLEE—p. 76; WHITE and MCDONALD—p. 77; WAINWRIGHT—p. 78; JEWETT—p. 79; BREIZ, HOYT and SCHEETZ—p. 80; BROWN—p. 81; MUSSEY, HARRISON and FORBES—p. 82; POTTER and BIGELOW—p. 83; STRONG—p. 84; REYNOLDS—pp. 84-85; JONES, WHITE and MCCLURE—p. 85; GRIMES—p. 86; TAYLOR—p. 87; WALTON—p. 88; BEACH—p. 89; FOOTE, TOMPKINS, MCMILLEN and TUTTLE—p. 90; PYLE and BLADES—p. 91; MORSE and MCELROY—p. 92; COOPER, WALTON, COOK and GAGE—p. 93; WHITMIRE and HUNT—p. 94; FARQUHARSON—p. 95; WELCH—p. 96; and BRADT—p. 100. See also many of the reports of those cases in Section III. in which a record of the treatment has been preserved. There were, however, always from the very first a certain number of medical officers who held for both acute and chronic fluxes the view expressed for the latter by DEBRULER—p. 42, *supra*—that "mercurials, opiates, and the ordinary astringents have been worse than useless, except so far as the opiates served to relieve pain or temporarily to check the bowels."

‡ SANFORD B. HUNT—*Camp diarrhœa and dysentery*, in Contributions relating to the causation and prevention of disease, and to Camp diseases, &c., published for the U. S. Sanitary Commission. New York, 1867, p. 305—uses the expression cited, after presenting his own testimony as to the futility of the means of treatment generally employed. He relates correctly that "it came to be a fixed doctrine at southern and southwestern stations, that confirmed cases had no security for cure except by removal to the north;" and adds, "among patients not thus removed, but treated in southern hospitals, much vacillation and irresolution were exhibited in the prescriptions of surgeons; as happens in all diseases the treatment of which by drugs is usually unsuccessful. To trace the history of an individual case, was to find that the prescriber had run the rounds of all remedies, from opium to astringents, from astringents to quinine, from quinine to bismuth, and from bismuth to nux vomica, from nux vomica to mercurials; returning almost always to opium as the drug which at least alleviated, if it did not cure." The same author gives his testimony—p. 304—that cathartics, especially Epsom salt and castor oil, were largely used during the war in the treatment of the early stages of the acute forms of diarrhœa and dysentery; and adds, "constipation preceded

For myself, I freely confess that I went into the field at the beginning of the war with predilections in favor of the use of opium in all the alvine fluxes, which experience very speedily modified. When I published my Outlines of the Chief Camp Diseases, in the latter part of 1863, I still favored its employment in a more liberal manner than I can now approve; but already at that time I insisted that opiates should not be "regarded as specific or curative agents" either in acute dysentery or the chronic fluxes, and that their use should be restricted to the fulfilment of two indications, namely, to relieve pain and to procure sleep.* Subsequent experience and study have inclined me more and more to the belief that even for these purposes it should not be indiscriminately resorted to in the fluxes, but should be reserved for those cases in which the urgency of the symptoms and failure to obtain relief in other ways make its use really indispensable.

A few physicians have maintained the hypothesis that opium is capable of exercising a directly curative influence upon the intestinal inflammation; but that it can actually do so, or that, indeed, it can ever cure any inflammatory process, has long been controverted by almost all those who have studied its actions most closely.† An examination of its

most of the cases, but, whether it had or not, it was found that a thorough purgation of the bowels from all irritants was the best and most speedy method of securing rest and opening the way for the successful administration of opiates." See, also, the testimony of Surgeon CHARLES H. RAWSON—*Health of the Army of the Mississippi*, Amer. Med. Times, Vol. IV, 1862, p. 312—who says, speaking of the diarrhœa of that army when in the vicinity of Corinth: "I have had occasion to use nearly all the remedies recommended, and of these I find opium stands at the head, and then one can combine it with bismuth, acetas plumbi, and tannin." Although, on account of the liberal use of opiates in other diseases and with the wounded, the figures give no notion of their use in the fluxes, the reader will be interested to learn that, according to the statement of Surgeon SPENCER, cited p. 708, the following quantities were purchased by the Purveying Department during the war: Opii pulvis, 552,196 oz.; opii tinctura, 828,258 oz.; opii tinct. camphorata, 993,311 oz.; pilulæ opii, (U. S. P.,) 813,156 dozen; pulv. ipecac. et opii, 447,151 oz. These quantities represent 43,404 pounds of opium, or rather more than twenty-one and a half tons, (of 2,000 lbs.,) besides which 27,200 ounces of sulphate of morphia were purchased, so that it must certainly be admitted that the pain-lulling drug was lavishly supplied for the relief of our suffering soldiers.

* WOODWARD—p. 229, *op. cit.*, p. 606, *supra*. With regard to acute dysentery, I wrote: "The use of opium in this complaint is to be regarded as limited chiefly to two simple indications. It is to be employed to relieve pain and to procure sleep. For the first purpose it is to be given in small and repeated doses, combined with whatever other medicament may be deemed advisable; for the second it is to be administered in full dose at bedtime. Opiates are not to be regarded as specific or curative agents. It is true, they control the frequency of the stools, but they may do so to a marked extent without exerting any favorable effect upon the progress of the disease." With regard to the chronic fluxes, I wrote—pp. 259 and 260: "The question of the use of opiates has excited considerable difference of opinion among military surgeons during the present war. While some administer them invariably, and with a freedom which borders on recklessness, others go so far as to exclude them altogether from their plan of treatment. The truth probably lies as ever between the two extremes. In cases in which the discharges are accompanied by griping or abdominal pain, opiates in moderate quantities are almost always admissible for the purpose of giving relief from this symptom. In this class of cases, they should be administered, combined with the other remedies employed, in moderate doses, frequently repeated, the quantity given being regulated by the violence of the symptoms and by the susceptibility of the patient. So also in cases attended by restlessness and sleeplessness at night, opiates may be administered in full doses at bedtime for the purpose of procuring sleep. Except under the above circumstances, however, they should be avoided as a general rule, as exercising little or no curative influence over the disease, and as liable, by interfering with the already impaired digestion, to do positive harm."

† Thus, for example, VOGLER—Kap. VII, S. 170, *op. cit.*, p. 738, *supra*—assumed a direct antiphlogistic power for opium. He writes: "Er wiedersteht offenbar Fieber und innerlichen Entzündungen. Ich habe in unzähligen Fällen Gelegenheit gehabt, die auffallend antiseptischen und entzündungswidrigen Würkungen desselben in dieser Krankheit zu bewundern." J. ARMSTRONG—*Some obs. on the utility of opium in certain inflammatory disorders*, Trans. of the Associated Apothecaries and Surgeon-Apothecaries of England and Wales, Vol. I, 1823, p. 309 *et seq.*—"prescribed large doses of opium, conjointly with bloodletting" in "acute and sub-acute abdominal inflammation," and declared that in efficacy this treatment "considerably exceeded that of any other remedy tried under similar circumstances"—p. 310; and CHRISTISON—*On the employment of opium for arresting internal inflammations*, London and Edinburgh Monthly Jour. of Med. Sci., Vol. I, 1841, p. 91—held that "opium may be employed for arresting acute internal inflammations in several ways. It may be given either alone, or along with ipecacuan, or in aid of general blood-letting." These opinions merely represent a modern heresy; they find no support among the ancient physicians, and among the moderns are advocated by comparatively few. Indeed, a diametrically opposite opinion has been accepted in many quarters. Thus GEORGE YOUNG—Sect. 34, p. 140, *op. cit.*, p. 739, *supra*—declared that "it is certainly a good general rule, that opium does harm in all internal inflammations, such as the phrenitis, pleuritis, angina, peripneumonia vera and notha, hepatitis, inflammation of the stomach, intestines, or any other internal part;" and elsewhere remarked—Sect. 39, p. 169: "I had established it as a general rule, that opium was improper in all those diseases in which bleeding was necessary." CULLEN—Vol. II, p. 238, *op. cit.*, p. 740, *supra*—was "persuaded of the propriety of Dr. Young's general rule;" and our own CHAPMAN—*Elements of Therapeutics and Materia Medica*, 4th Ed., Philadelphia, 1825, Vol. II, p. 169—though he made "many exceptions," as indeed both YOUNG and CULLEN did also, admitted that "as a general rule this is undoubtedly correct." (I note, by the way, that CHAPMAN appears to have confounded GEORGE YOUNG with THOMAS YOUNG, the originator of the undulatory theory of light, for he speaks of him as "a late writer of some distinction,"—*loc. cit.*—which would apply to the latter, but hardly to the former author when CHAPMAN wrote.) The necessary space cannot be taken in this place, nor indeed is it at all desirable here, to discuss in detail the literature of the use of opium in inflammation. I suppose no one at the present time seriously holds to the antagonism suggested by YOUNG, or would hesitate to give opium to a patient, if there was any reason for doing so, merely because he had an inflammation. On the other hand, belief in any direct antiphlogistic action of opium is at the present day pretty generally abandoned. We may readily agree with STILLÉ—Vol. I, p. 855, *op. cit.*, p. 711, *supra*—that the "local inflammatory symptoms are frequently aggravated and perpetuated by concomitant states of the general system," which may be benefited by opium, and that in such cases it may be regarded as "indirectly tending to cure the inflammation;" but it is equally true that there are concomitant morbid states of the general system, as well as concomitant local troubles, that are aggravated by the use of opium, and under such circumstances its use is "indirectly" injurious to the inflammatory process. G. B. WOOD—*A Treatise on Therapeutics*, &c., 2d Ed., Philadelphia, 1860, Vol. I, p. 743—regarded opium as an indirect arterial sedative, because a diminution in the frequency of the pulse follows in a short time the excitement produced by a full dose. "A diminution in its force, also, comes on after a time; and a positive depression of the circulation is thus effected." For these reasons he looked upon opium as useful in inflammation; nevertheless he recognized that "its first stimulant action, however, is in the way," and admitted that it should not be employed till the

effects upon similar inflammations within the reach of the observer's eye, for example, catarrhal and diphtheritic inflammations of the throat, will serve to indicate the futility of such hopes; and all who have witnessed numerous autopsies during epidemics of dysentery, must have repeatedly observed the most deplorable evidences of destructive inflammation in the intestines of subjects treated with opium in unstinted doses, for days or even weeks before death, with the effect indeed of blunting their sensibility to pain, but without exercising any apparent influence upon the progress of the disease.

Not only is it vain to hope for any direct benefit to the local inflammatory process from the use of opium, but the physician should distinctly recognize that there are several ways in which this drug is liable to prove injurious in dysentery. Chief among these, it is to be observed that, whenever in this disease the power possessed by opium of diminishing the peristaltic action of the intestines is carried to the extent of temporarily checking the stools, the fermenting or putrefying matters composing them are retained in contact with the inflamed mucous membrane of the lower bowel, where they must tend to intensify the inflammatory condition, and even to transform simple catarrhal processes into diphtheritic dysentery. Moreover, the use of opium is prone to aggravate the digestive disturbances that already exist; the belief expressed by some that it diminishes the hepatic secretion, which would constitute a serious objection to its use, does not appear to rest upon a very

force of the circulation has been subdued by treatment, or has subsided in the course of the disease. But the more we learn by exact observation of the action of opium upon the circulation, the more improbable it becomes that this action can of itself be beneficial in inflammation. A. BORDIER—*Des nerfs vaso-moteurs ganglionnaires*, Paris Thesis, No. 72, 1868, p. 72 *et seq.*—has studied with the sphygmograph the effects of moderate doses of opium (5–20 centigrammes daily) upon the human circulation. His observations show that the full, apparently strong, slow pulse, that so generally follows in a short time the use of opium, owes these qualities in fact to a considerable diminution in the arterial tension. In the most marked cases the lever of the sphygmograph rose almost vertically two or three times as high as in the normal condition, and in its oblique descent the increased dicrotism characteristic of feeble tension was distinctly seen. In one of his cases, either because the dose was larger or the examination made later, the pulse was more frequent instead of slower; but the sphygmograph gave the same evidence of diminished arterial tension. I refer the reader to the work cited for the reasoning by which BORDIER endeavors to show that these results depend upon vaso-motor paralysis, and that the effects of opium are comparable to those produced by the section of the great sympathetic nerve. The accuracy of his conclusions in this direction does not concern us here; but if it be true that the effect of opium is to diminish the arterial tension, we know that this phenomenon is accompanied by an increased velocity of the circulation (see E. J. MAREY—*Phys. Méd. de la Circulation du Sang*, Paris, 1863, p. 157) which can hardly be imagined to be otherwise than injurious to the inflamed part. In a recent lecture Professor G. SÉE—La Tribune Médicale, année X, 1877, p. 76—has criticised the observations of BORDIER, declaring that in the first stage of the action of opium the pulse is excited and the arterial tension increased; in the second stage the pulse retarded and irregular, but the tension still the same. I know not on what experimental evidence, if any, this statement is based. On the other hand, H. SCHÜLE—*Sectionsergebnisse bei Geisteskranken*, &c., Leipsic, 1874, S. 50—from sphygmographic traces taken after the administration of hypodermic injections of morphia to insane patients, has also come to the conclusion that indications of a diminished arterial pressure (die Momente einer geschwächten Arterien-Innervation) result, although I note that his curves—Taf. IV, Figs. 12–19—seem to show precisely the reverse of BORDIER'S. The diminished pressure inferred by these experimenters has been actually measured on animals by the manometer. R. GSCHEIDLEN—*Ueber die physiologischen Wirkungen des essigsauren Morphiums*, Unters. aus dem physiologischen Laboratorium in Würzburg, Theil II, 1869, S. 33—using a mercurial manometer directly applied to the arteries of dogs and rabbits, found that the injection of acetate of morphia subcutaneously, or into a vein, was usually followed by a diminished blood pressure. This was occasionally preceded by a considerable increase of the pressure, but generally any such temporary increase was inconsiderable and speedily followed by a fall. GSCHEIDLEN emphasizes the circumstance that in his observations the increased blood pressure, when it occurred, was not always accompanied by corresponding changes in the frequency of the pulse, and hence infers that it is not through the blood pressure, but, as he concludes from subsequent experiments, by a central influence exerted through the vagus that the changes in pulse frequency following the action of the drug are determined. In his still more recent experiments, WITKOWSKI—*Ueber die Morphiumwirkung*, Archiv für Exp. Path. u. Pharm., Bd. VII, Heft 3, 1877, S. 253—arrived at the conclusion that every hypodermic injection of morphia is followed by more or less (sometimes quite slight) diminution of the arterial pressure; he measured it with the kymographion of Ludwig, on dogs, cats and rabbits, curarized and artificial respiration kept up, and regards it as probably the result of a dilatation of the peripheral bloodvessels determined by central influences. Lastly, I may refer to the essay of P. PICARD—*Sur l'action de la morphine chez les chiens*, Comptes Rendus, T. LXXXVI, 1878, p. 1144—who affirms that relaxation of the small peripheral arterioles, after the administration of morphia, is readily measured in frogs by means of a micrometer; that in vigorous dogs this dilatation, and the consequent diminution of the normal resistance to the blood stream, is so great as to permit the cardiac pulse to be recognized in the jugular veins; and that the use of the manometer confirms this view. He concludes: "Tous ces faits ont évidemment la même signification: ils expriment la dilatation des vaisseaux et la diminution des résistances au cours du sang qui en est la conséquence." PICARD emphasizes the important fact that the considerable diminution in the mean pressure of the arterial blood (l'abaissement considérable de la pression moyenne) in dogs under the influence of morphia coincides, after the action is fully established, with considerable diminution in the frequency of the heart beats; and he reports that both phenomena continue to be observed after the pneumogastric nerves are cut. From these facts, and from experiments relating to the action on the pupil, he concludes: "Il faut donc admettre que la morphine a paralysé partiellement le système nerveux d'excitation du cœur en même temps qu'elle mettait dans un état identique le sympathique des vaisseaux et celui qui commande la dilatation de la pupille." Now, although I will readily concede that these interesting observations are insufficient to establish positively that opium is *per se* injurious to the inflammatory process, it may safely be affirmed that they demolish completely any speculations which endeavor to support the notion that opium acts as an antiphlogistic by appealing to its effects upon the circulation. My esteemed friend H. C. WOOD—p. 213, *op. cit.*, p. 675, *supra*—presents the question of the effect of opium upon the inflammatory process from a more reasonable point of view when he writes: "By allaying irritation and pain, opium affords relief in most cases of inflammation," though I should like to qualify the statement by saying many cases, instead of most, for there are probably many cases also in which its other operations do more harm than the good produced by its anodyne virtues; but when he adds that in certain varieties of inflammation "it seems to do much more than this, exerting, in some way at present difficult to explain, a life-saving influence." I must confess that I know of no evidence that supports such a belief.

sure foundation;* but it is a fact, which every physician of experience in this disease must have frequently noticed, that it often renders the anorexia more extreme and increases the tendency to nausea and vomiting. These are objections to its use even for a short time in dysentery; but when the disease is prolonged for several weeks, as is so often the case, the daily use of opium is furthermore prone to produce a condition of system, the result of chronic opium intoxication, which is certainly unfavorable to recovery. At the same time it should be recollected that, as was well known by the older physicians,† the griping pains and distressing tenesmus of dysentery can very generally be relieved by prompt resort to the use of evacuants and other suitable measures,‡ so that whenever this is possible it is clearly unnecessary to incur the dangers just indicated.

But it will sometimes happen that, in spite of the most judicious use of other measures, the sufferings of the patient continue to be so great that it becomes imperative to resort to some anodyne for their relief; and although opium is by no means the only drug that answers this indication, it is undoubtedly the most uniformly successful, and will very often afford a respite from present distress when all other means fail. Under such circumstances the judicious practitioner will not hesitate to employ this powerful drug to give

* J. PEREIRA—*Elements of Mat. Med. and Ther.*, 3d Amer. Ed., Vol. II, Philadelphia, 1854, p. 1041—attributed the constipation produced by opium in part to the diminished secretion of bile he supposed it to determine. In support of this view he says: "Sprocgel found the choledic ducts of animals, to which opium had been given, filled with bile; yet it had not passed into the intestines, for the feces were scarcely tinged by it, but had the appearance which we observe them to have in jaundiced patients." STILLÉ, also—Vol. I, p. 830, *op. cit.*, p. 711, *supra*—says of opium constipation: "It is probable, also, that, as observed by Sprocgel, the diminished secretion of bile may contribute to this effect," &c. In a foot note to this passage he adds: "Quoted by PEREIRA, *op. cit.*, art. Opium." But PEREIRA had never read SPROEGEL, for he himself adds to the passage cited above: "Quoted by Christen, *Opium hist.*, etc., p. 66, 1820." I have not been able to see the work of C. A. CHRISTEN—*Opium historice, chemice atque pharmacologice investigatum*, Vienna, 1820—but have no doubt that PEREIRA cites it correctly, for in a review of it by ANTHONY TODD THOMSON—The Edinb. Jour. of Med. Sci., Vol. III, 1827, p. 376—I read: "Dr. Christen, however, points out some facts, which are exceptions to the general rule, that 'opium suppresses all the secretions.' Thus, as Linnæus *(Amœn. Acad.*, viii. 298) asserted, the flow of milk is not impeded but augmented by opium; the secretion of the bile is also increased, although the excretion is diminished, *(Jahn*, ii. 207);" and "Sprocgel remarked, that in animals feeding upon opium, the ductus choledochus was turgid with bile, whilst the alvine evacuations, like those of individuals labouring under jaundice, were scarcely coloured." Nevertheless, in the work referred to—J. A. T. SPROEGEL—*Experimenta circa varia venena in vivis animalibus instituta*, (1753;) I cite from the reprint of HALLER—*Disp. ad Morb. Hist. et Cur.*, T. VI, Lausanne, 1758, p. 557 *et seq.*—I not only am unable to verify the statement of CHRISTEN, but find directly the opposite asserted. SPROEGEL, indeed, reports that he found on dissection in several instances the gall-bladder full of bile, but he also reports generally the presence of a notable quantity of bile in the intestine, and even in the stomach, and was so struck by this circumstance that he declares it to be characteristic of opium poisoning: see Exp. 24, p. 563, in which, describing the dissection, he writes: "Ventriculus aqua flava, subnigra repletus erat, non vero inflammatus, intestina bile plena, uti semper in animalibus opio interemtis, nullum vero in his visceribus inflammationis signum adparuit." As against these misconceptions I may cite P. A. CHARVET—*De l'Action comparée de l'Opium*, &c., Paris, 1826, p. 217—who made great numbers of experiments on animals, and who, after pointing out that the use of opium is followed by neither yellowness of the conjunctiva or skin nor by clay-colored stools, and that nothing has been observed that indicates a diminution of the biliary secretion, adds: "J'ai ouvert un grand nombre d'animaux de différentes classes, empoisonnés par l'opium, et je n'ai jamais vu, chez eeux qui ont une vésicule biliaire, qu'elle fût moins pleine qu'à l'ordinaire. D'ailleurs, je répète que la coloration, brune ou jaune, des matières exerémentitielles, semble mettre hors de doute la non-suppression de cette sécrétion." So likewise H. NOTHNAGEL—*Handbuch der Arzneimittellehre*, Berlin, 1870, S. 6—testifies: "Ueber das Verhalten der Abscheidung des Darmsaftes und der Galle ist beim Menschen nichts Sicheres festgestellt. Die Farbe des Stuhls ist in der Regel unverändert." And R. BUCHHEIM—*Lehrbuch der Arzneimittellehre*, 3te Aufl., Leipsic, 1878, S. 465—expresses the opinion that it is still questionable whether the use of opium diminishes the intestinal secretion; that the constipation it produces in healthy persons is due merely to retardation of the peristaltic motion of the bowels, and that there is no evidence that it affects the liver: "Auch die Leber wird, so viel wir bis jetzt wissen, durch die Opiumbestandtheile nicht verändert." I will not attempt to give here a complete list of the works treating of the physiological effects of opium whether on man or animals, but merely subjoin the titles of those I have found of interest while preparing these pages. The learned work of TRALLES—Sect. I, Cap. 2, p. 49 *et seq.*, *op. cit.*, p. 737, *supra*—contains a chapter entitled, *Phænomenorum omnium succincta recensio, quæ opium assumtum in corpore humano insequuntur*, which is rich in references to the earlier observations and opinions. For the progress of subsequent inquiry I have consulted, in addition to the works already cited in this and the previous note, CULLEN—Art. *Opium*, Vol. II, p. 224 *et seq.*, *op. cit.*, p. 740, *supra;* JOHN LEIGH—*An experimental inquiry into the properties of opium*, &c., Edinburgh, 1786. (This essay, which gained the Harveian prize for 1785, and is dedicated to "George Washington, Esq.," is of special interest to the American reader, because its author was a countryman of ours;) SAMUEL CRUMPE—*An Inquiry into the Nature and Properties of Opium*, London, 1793; J. B. G. BARBIER—*Traité Elémentaire de Mat. Méd.*, 4me Éd., T. III, Paris, 1837, p. 1 *et seq.;* TROUSSEAU et PIDOUX—T. II, p. 11 *et seq.*, *op. cit.*, p. 716, *supra;* A. KÖLLIKER—*Phys. Unters. ueber die Wirkung einiger Gifte*, Virchow's Archiv, Bd. X, 1856, S. 241 *et seq.;* J. F. H. ALBERS—*Das Opium u. Affium*, &c., same Jour., Bd. XXVI, 1863, S. 225 *et seq.;* W. BANT—*Die physiologische Wirkung einiger Opium-Alkaloide*, &c., Archiv für Anat., Phys. u. wiss. Med. Jahrg. 1869, S. 112 *et seq.;* J. HARLEY—*The Old Vegetable Neurotics*, London, 1869, Chap. 4, p. 99 *et seq.;* S. WEIR MITCHELL—*On the effect of opium and its derivative alkaloids*, The Amer. Jour. of the Med. Sci., Vol. LIX, 1870, p. 17; and CLAUDE BERNARD—*Leçons sur les Anesthésiques et sur l'Asphyxie*, Paris, 1875, p. 163 *et seq.* References to a number of other papers are appended to the essay of WITKOWSKI, cited last page.

† Note, for example, with what care HILDANUS—Cap. 9, p. 681 *et seq.*, *op. cit.*, p. 644, *supra*—insists that an effort should be made, 1, to remove the cause of the pain, and, 2, to mollify the acrid and malignant humors which produce it, before resorting, 3, to drugs which stupefy the sensibility of the part. Under 1, he counsels emetics, purgatives, diuretics and sudorifics, besides venesection, the application of cups, &c. Under 2, emollient drinks, such as milk, emulsion of sweet almonds and whatnot, as well as enemata of the same character. Only if these measures fail (si dolor bis medicamentis non sedatur) does he commend such anodynes as syrup of poppies, Philonium, theriaca and the like. With this chapter, which well represents the views of the best instructed physicians of the seventeenth century, compare the declaration of CULLEN—cited p. 740, *supra*—that it is only the neglect of purging that renders opiates very necessary, and the recent report of MÉRY—*op. cit.*, p. 708, *supra*—with regard to the great relief of the tormina, tenesmus and other painful symptoms of dysentery afforded by the use of sulphate of soda.

‡ Such as enemata, concerning which vide *infra*, warm fomentations, rubefacients, &c.

relief, but he will always remember the dangers to which its operation exposes his patient, and will endeavor to avert them by proper precautions.* The injurious effects of locking up ammoniacal or other products of decomposition in the alimentary canal may be reduced to a minimum by the simultaneous or alternate employment of adequate doses of suitable purgatives; and chronic opium intoxication may be avoided by suspending the administration of the drug as soon as possible, or by alternating it with other anodynes.

It may sometimes also be necessary to resort to opium in dysentery for the purpose of procuring sleep, but it should not lightly be employed with this object. Sleeplessness, like pain, will very often yield to the judicious use of evacuants, and in other instances can frequently be controlled by bromide of potassium. But there are cases in which these measures fail to give relief, and in which the sleeplessness and restlessness of the patient become a source of danger. In such cases opium often proves to be the best hypnotic at our disposal, and may be resorted to without hesitation, in conjunction, however, always with the precautionary measures just referred to. Whether it may not, besides, be advisable sometimes to resort to opium for the purpose of moderating, without actually suspending, the intense activity of the peristaltic action which is not unfrequently observed, is a more doubtful question; but, in a general way, when these movements are painful, they fall under the rules relating to pain; when not painful, it is probably better on the whole to resort to other modes of treatment.

The choice of the preparation to be employed, when the use of opium has been determined upon, is probably in the majority of cases a matter of little moment. The solid drug, its extract, tincture, or the salts of morphia, can generally be employed indifferently,† and only in a few patients will experience show that some one preparation is better borne or produces more agreeable effects than another. Where such idiosyncrasies are known to exist they should be respected; and when in other cases the preparation selected appears to disagree, and the indications for the use of an opiate continue urgent, some one of the others may often be substituted with advantage, or other anodynes may be beneficially combined. With regard to the dose, a good deal must be left to the judgment of the practitioner. When the object is to allay pain, the dose should be given at such intervals as to keep the patient fairly under the influence of the drug, and a very moderate quantity at a time will usually be sufficient. When it is desired to procure sleep, a single adequate dose should be administered about half an hour before the usual bedtime.

In some cases, perhaps chiefly those in which the relief afforded by opium is most needed, the patient displays a marked insensibility to its influence. It is in this condition that heroic doses have so often been administered, and it is to be feared not always with the

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* The dangers of the abuse of opium in unskilful hands were long ago insisted upon by WEDEL—Vol. II, p. 518, *op. cit.*, p. 737, *supra*—in striking language: "Sacra vitæ anchora est opium, bene et circumspecte agentibus: cymba autem Charontis in manu imperiti, et ceu gladius in manu furiosi;" and we may well use with regard to it the proverb which DEGNER—note, p. 230, *op. cit.*, p. 625, *supra*—applied to all potent medication in dysentery: "Clava Herculis non valet nisi in manu Herculis."

† That is of course on the supposition that moderate doses are given, for when it comes to the immense doses that some physicians have ventured upon, I suppose there can be little doubt that the morphia salts are safer than an equivalent quantity of opium. CLAUDE BERNARD—p. 172, *op. cit.*, p. 746, *supra*—indeed, goes so far as to assert that if the dose of opium that will produce a fatal result in any animal be ascertained, it will be found that an equal dose of morphia will be borne with impunity. I have not referred in the text to any of the other alkaloids of opium, because as yet none of them are entitled to our confidence for the treatment of the fluxes. If it were true, as claimed by CLAUDE BERNARD—p. 181 *et seq.*, and p. 511 *et seq.*—that by means of narceia, narcotic and anodyne effects, equal or superior to those produced by morphia, could be obtained with less headache and other disturbances, that alkaloid would be an important addition to our resources. But a number of excellent observers, such as BAXT and HARLEY—both cited in note *, p. 746, *supra*—in the old world, S. WEIR MITCHELL—p. 26, *op. cit.*, same note—and J. M. DA COSTA—*Obs. on the action of narcein*, Pennsylvania Hospital Reports, Vol. I, 1868, p. 177—in the new, have obtained different results; and it seems probable that under the name of narcein substances of diverse properties, and probably by no means of simple composition, have found their way into the market. This is true also as to codeia, the third of the narcotic principles contained in opium. For information as to the separate action of these and the other so-called principles of opium the reader may consult especially the last five papers enumerated in note *, p. 746, *supra*.

impunity that has been boasted. This condition results rather from the circumstance that the drug is not absorbed than because the nervous system is insensible to its influence, and a resort to *hypodermic injections of morphia* in such cases seems much more reasonable than the reckless introduction of large quantities of opiates into the stomach where their subsequent operation must be a matter of uncertainty. Such injections produce the anodyne or soporific effect desired, promptly, efficiently, with a minimum quantity of the medicine; and there is no difficulty, by repeating them at proper intervals, in keeping up for a long time any desired degree of anodyne effect. This mode of administering morphia has been employed by Hunter in enteritis, by Behier in the diarrhœa of phthisis.* Eulenburg has used with advantage hypodermic injections of tincture of opium, and Legagneur of muriate of morphia in catarrhal diarrhœa.† Rinteln, some of the Frankfort physicians as reported by Schmidt, Prince, Gallaher and Washington‡ have resorted to morphia injections in acute dysentery; indeed, the two physicians last named attribute to them the power of curing the disease without other medication.

This method seems well worthy of further trial as likely to prove in many cases more satisfactory than the administration of opium by the mouth or rectum, and certainly should supersede the clumsy plan of dusting morphia salts on a blistered surface. Pletzer, Bois, Lorent, Erlenmeyer and Eulenburg have lauded this mode of giving morphia in various forms of peritonitis,§ and it seems probable that it would prove equally advantageous in the intercurrent local or general peritonitis that so often accompanies dysentery. I do not doubt the accuracy of the observations of those who claim that dysentery may be cut short by these hypodermic injections, nor, indeed, of those who report prompt cures after the internal administration of large doses of morphia or other preparations of opium; but such observations must refer to mild catarrhal forms of the disease, which can almost always be promptly relieved by evacuants, without exposing the patients to the risks inseparable from the use of opiates for this purpose.

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* C. HUNTER—*Letter* to The Med. Times and Gaz., 1865, Vol. I, p. 612. The observations of BEHIER have been reported by C. CODRESCU—*De l'emploi des injections sous-cutanées dans des cas de vomissements, de diarrhée et de névralgies intercostales chez les phthisiques*, Paris Thesis, No. 118, 1865, p. 24. He obtained excellent results when the disease was not too far advanced, but remarks that it is vain to hope a happy result in the colliquative diarrhœas of the last stages. EULENBURG—*Die Hypodermatische Injection der Arzneimittel*, Berlin, 1867, S. 165—reports a case of diarrhœa dependent on intestinal tuberculosis in which subcutaneous injections of tincture of opium were vainly tried; and LEGAGNEUR—p. 33, *op. cit., infra*—after trying hypodermic injections of morphia in similar cases, concludes: "Il ne paraît pas très-efficace dans le traitement de la diarrhée des phthisiques."

† EULENBURG—S. 164, *op. cit.* H. LEGAGNEUR—*Du traitement de la diarrhée par les injections hypodermiques de morphine*, Paris Thesis, No. 476, 1876. He used the muriate of morphia for this purpose, and thought—p. 33—that it was best to begin with 5 milligrammes morning and evening, although most patients will readily permit the dose to be increased to 4 centigrammes a day. He concludes from his observations that this is a good mode of treating diarrhœa, and sometimes succeeds where all other means have failed. This essay contains also some interesting evidence with regard to the fact that saline and other purgatives in adequate doses will operate while the patient is still under the influence of the morphia salt—p. 11 *et seq.* F. A. HARTSEN—*Zur Therapie des Durchfalls*, Virchow's Archiv, Bd. LXI, 1874, S. 287—has also recommended hypodermic injections of morphia in diarrhœa, but only in case the flux is so severe (heftig) that the opium taken by the mouth passes through the alimentary canal without being reabsorbed.

‡ RINTELN—*Eine Ruhr-Epidemie im Amte Hausberge, Kreis Minden, im Herbste* 1865, Berliner Klin. Wochenschrift, Jahrg. III, 1866, S. 461—reports having injected ⅛ to ¼ of a grain of acetate of morphia in the vicinity of the navel in a few cases of dysentery for the relief of tormina, and with instantaneous results, but he did not regard the effect as sufficiently durable to replace the internal use of opium. H. SCHMIDT—*Jahresbericht über die Thätigkeit des ärztlichen Vereins im Jahre* 1870, Jahresbericht, &c., der Stadt Frankfurt A. M., herausgegeben von dem aerztlichen Verein, Jahrg. XIV, 1870, S. 292—reports that morphia injections were very commonly used that year in dysentery by the members of the society, both to relieve the pain and to diminish the frequency of the stools. DAVID PRINCE—*The abortive treatment of dysentery by salts and chloral*, St. Louis Med. and Surg. Jour., Vol. XII, 1875, p. 475—only employed the morphia injections as a means of enabling the stomach when irritable to retain the hydrate of chloral, which he recommends in the average dose of 30 grains combined with an ounce or two of Epsom salts. T. J. GALLAHER—*On hypodermic injections*, The New York Med. Jour., Vol. XIII, 1871, p. 518 *et seq.*—has reported three cases of sporadic (probably catarrhal) dysentery treated with hypodermic injections (¼-½ of a grain) of morphia. He remarks: "These cases show that not only the pain and tenesmus of dysentery may be instantly relieved by the hypodermic injection of morphia, but the disease itself may be entirely cured without the employment of any other remedy. The cure, too, is much quicker than by the usual method, and the administration of frequent doses of nauseous drugs obviated. From one to two injections, mostly but one, daily, is all that is required. I have resorted to this method also in semi-chronic forms of dysentery and diarrhœa, with entire success." J. E. WASHINGTON—*Magic effects of hypodermic puncture of morphia in cases of dysentery*, Nashville Jour. of Med. and Surg., Vol. XXII, 1878, p. 48—has also reported several cases of sporadic dysentery cured by hypodermic injections of morphia.

§ H. PLETZER—*Die hypodermatischen Injectionen*, Zeitschr. für pract. Heilk., Bd. I, 1864, S. 258—in puerperal peritonitis; A. BOIS—*De la méthode des injections sous-cutanées*, Paris, 1864, p. 23—in subacute peritonitis; H. LORENT—*Die hypodermatischen Injectionen*, Leipsic, 1865, S. 13—in tubercular peritonitis, peritonitis following perforation of the intestine, perityphlitis, &c.; A. ERLENMEYER—*Die subcutanen Injectionen der Arzneimittel*, 3te Aufl., Neuwied, 1866, S. 43—in puerperal and tubercular peritonitis; and EULENBURG—S. 168, *op. cit.*, note *, *supra*—in puerperal peritonitis.

Most of the physicians who have employed opium in acute dysentery have also made use of it in the chronic forms of the disease. The complex formulæ containing opium preserved by Galen were lauded in the cœliac flux as well as in dysentery.* For centuries Theriaca, Philonium and the like were made use of in chronic dysentery,† and the various laudanums of Paracelsus and subsequent physicians were employed for the same purpose.‡ In modern times opium has been administered to these chronic cases chiefly in combination with astringents, and its power of diminishing the activity of the peristaltic movements has perhaps been valued quite as much as its anodyne or soporific properties. Even such physicians as Berndt, Canstatt and Savignac, who have been most careful with regard to the use of opium in acute dysentery, have recommended it without hesitation in chronic cases;§ and it is to be feared the unwillingness to employ opium under these circumstances, which Tripler manifested,‖ has been by no means generally felt.

Yet precisely in these chronic cases our modern knowledge of the disease and of the drug would appear to indicate the importance of caution. No fact is better established with regard to the chronic fluxes than the diminished activity of the digestive processes during the progress of the disease; and next to their narcotic action, no property of opium or of the morphia salts is better known than the interference with the digestive function which accompanies their operation.¶ Moreover, the probability that constipation, artificially produced by opium during the progress of a chronic flux, may serve to light up an intercurrent acute diphtheritic dysentery, as constipation occurring accidentally so often does, should not be overlooked; and the danger of producing chronic opium intoxication, with all its attendant evils, is even greater in the chronic than in the acute forms of dysentery. In these chronic cases, therefore, opium should be regarded rather as an anodyne and hypnotic, which may occasionally be resorted to in times of urgent need, than as a medicine to be steadily and constantly employed, either alone or in combination with other remedies, with the vain hope that it will aid in effecting a cure.

It is unnecessary here to enter into a detailed history of the use of opiates in the various forms of diarrhœa.** For the most part this application of the drug has shared the fortunes of its use in dysentery, and those who have employed it in the one affection have also resorted to it in the other. It is, indeed, quite proper that the rules applicable to catarrhal dysentery should govern our action in the case of diarrhœas resulting from catarrhal inflammation of the intestinal mucous membrane; and the considerations that indicate the importance of caution in the use of opiates in the former complaint are, to a great extent, applicable to the latter. In diarrhœas resulting from mere irritation of the intestinal mucous membrane not amounting to inflammation, opiates can no doubt be given with greater impunity; but in this case they are still less necessary.

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* See note §, p. 735, *supra*. † For Theriaca, see note ‖, p. 729, *supra;* for Philonium, see note §, p. 735, *supra*.

‡ For information with regard to some of these laudanums, see note ‡, p. 736, *supra*.

§ BERNDT—Hefte 3 u. 4, S. 231, *op. cit.*, p. 717, *supra:* "Das Opium ist aber ein wichtiges Heilmittel bei den Nachkrankheiten der Ruhr," especially when a chronic flux with ulcerated bowels ensues. "Hier gehört das Opium in Verbindung mit den Adstringentibus und der Milchdiät zu den hülfreichsten Mitteln." CANSTATT—Bd. 1, S. 530-31, *op. cit.*, p. 717, *supra*. SAVIGNAC—pp. 376-77, *op. cit.*, p. 620, *supra*—not only declares that "l'adjonction de quelque préparation opiacée aux astringents, aux obturants, aux balsamiques que nous verrons indiqués dans la dysentérie chronique, rend leur action plus douce et plus assurée, et contribue avec eux à tarir les sécrétions intestinales;" but concludes his article on opium by lauding the employment of its extract in subacute and yet more in chronic cases, and mentions that he has witnessed its successful employment in doses as large as the patient can bear, continued for many days. I will not attempt to cite the numerous other authors who have commended the employment of opium in combination with the astringents in chronic dysentery; let it suffice here to refer to MARTIN—p. 714, *op. cit.*, p. 621, *supra;* MOREHEAD—p. 303, *op. cit.*, p. 657, *supra;* and BARRALLIER—p. 772, *op. cit.*, p. 603, *supra*.

‖ TRIPLER—*loc. cit.*, p. 743, *supra*.

¶ Note on this subject the striking experiments of CLAUDE BERNARD—p. 169 *et seq.*, *op. cit.*, p. 746, *supra*.

** For an introduction to the study of the early literature of this subject I would refer the reader to the work of TRALLES—Sect. III. p. 211 *et seq.*—who has patiently discussed the use of opium in various forms of diarrhœa.

Nevertheless a very considerable number of modern practitioners make use of opium with a liberal hand in the treatment of diarrhœa. It is given alone, as well as in combination with divers astringents, aromatics and cretaceous preparations, forming the various diarrhœa mixtures which from time to time have enjoyed considerable popularity. Doubtless these remedies are often employed with impunity; indeed it may be conceded that in a vast number of cases they afford prompt, speedy and complete relief; but it may well be questioned whether they do not do positive injury in many others, and whether, in the class of cases that they appear to benefit most, equally speedy and complete relief could not be procured by other measures.* That they are often appealed to in vain is soon learned by the hospital physician, who will generally find that the majority of the cases of dysentery and severe diarrhœa that come under his observation were treated at the start in this way. It is well worthy of inquiry whether the proportion of these serious cases is not greater when opiates are freely resorted to at the commencement of what appear to be trivial diarrhœas than when other measures are relied on.

I confess, the more I learn of the behavior of such cases under treatment, the more I am inclined to advise that opiates should be as far as possible avoided. It may readily be admitted that there are cases in which they cannot be dispensed with; in which the griping pains continue, in spite of the administration of suitable evacuants, with such intensity as to justify a resort to this potent anodyne; but even in these cases it should be employed rather as a temporary means of allaying pain than with a view to any supposed curative effect, and should be accompanied or followed by suitable evacuants. Perhaps it is most frequently indicated in those cases of acute gastro-intestinal catarrh, which in this country are generally spoken of as cholera morbus. Here, the rapidity and severity of the vomiting and purging, as well as the intensity of the griping pains, seem to warrant the employment of an opiate; and yet the condition of the stomach renders its action exceedingly uncertain. Under such circumstances hypodermic injections of morphia have been lauded by Ashe and Von Græfe.† They have the advantage of promptness and of much greater certainty in their effect than can be hoped under these circumstances from the internal administration of the drug, and, moreover, they are less likely to impede the subsequent operation of evacuants or other measures that may be indicated.

Other anodynes and hypnotics.—Among the remedies of this class which have been made use of in the treatment of the fluxes, *hyoscyamus* was already employed by the Greek physicians. It figures, in connection with opium, in several of the formulæ commended by Galen as useful in dysentery and the cœliac flux, especially in the long-

* Here I may refer with approval to the testimony of Trousseau—Vol. III, p. 110 *et seq.*, *op. cit.*, p. 644, *supra*—as to the efficacy of the saline purgatives, especially sulphate of soda and Rochelle salt, in the treatment of catarrhal diarrhœa. I agree also with his commendation of the subnitrate of bismuth in the later stage of the disease. But I cannot accept his view that opium is desirable in what he calls "diarrhée nerveuse," which appears to me to be merely a variety of catarrhal diarrhœa, or in his "diarrhée par tonicité exagérée," as to the existence of which as an independent affection I may be permitted to express grave doubts; but I could well wish that those who think, with the great clinician, that opiates are desirable in such cases, would content themselves with his favorite dose, a single drop of the laudanum of Sydenham—p. 117.

† I. Ashe—*The subcutaneous injection of morphia in cholera*, Med. Times and Gaz., 1862, Vol. II, p. 644—reports two cases of cholera (he calls them Asiatic cholera, which is probably going too far) promptly relieved, the one by a single injection of 15 minims of liquor morphiæ acetatis, the other by two such injections. The cases occurred in the practice of Dr. Ricketts, of Birkenhead, who suggested the treatment. A. von Græfe—*Therapeutische Miscellen. IV. Ueber die hypodermatischen Einspritzungen als Heilmittel in der ophthalmologischen Praxis*, Archiv für Ophthalmologie, Jahrg. IX, 1863, Abth. 2, S. 63. In cholera morbus (Brechdurchfällen) he declares this remedy to possess a life-saving power: "Hier können die hypodermatischen Injectionen, wie ich mich thatsächlich überzeugt, eine lebensrettende Bedeutung erhalten." I note that W. Leube—*Krankheiten des Magens und Darms*, Ziemssen's Handbuch, Bd. VII, 2, S. 40—who boldly declares that not only in sporadic cholera but in acute, violent, gastric and intestinal catarrh no remedy is so effectual as opium given internally in the form of powder or tincture, does not even allude to the question of hypodermic medication in these conditions. Further on, in speaking of the treatment of ordinary intestinal catarrh, after advising the preliminary use of evacuants, he declares that the most important indication is to secure rest to the inflamed organ—S. 275; and adds that this result, as experience has shown in thousands of cases, can best be obtained by opium. It is a significant circumstance, that so many of those who share these views also agree with Leube in ignoring the most efficient mode of administering the drug in such cases.

celebrated Philonium.* To the same combination the virtues of the cynoglossus pills were due, a famous nostrum which Mesue lauded in catarrhal affections of the respiratory organs, and the physicians of the sixteenth and seventeenth centuries often employed in dysentery. This formula was still preserved in the French Codex of 1866, and Savignac acknowledged that he occasionally prescribed it in chronic dysentery.† For nearly two thousand years, therefore, combinations of opium and hyoscyamus have enjoyed the confidence of medical practitioners; and although during the present century they have been but rarely employed in the fluxes, it may perhaps be questioned whether some equivalent compound might not be brought into use with advantage.

More than twenty years ago I witnessed on several occasions, in the practice of the late Professor Joseph Carson, of Philadelphia, the excellent effects of a combination of extract of hyoscyamus with muriate of morphia given at bedtime to procure sleep in various painful affections;‡ and I have myself since that time repeatedly employed the same preparation with advantage in various complaints, among others in the acute intestinal catarrhs so common during our hot summers. The addition of the hyoscyamus always appeared to increase the hypnotic and anodyne effects of the morphia, to avert the tendency to constipation and to diminish the digestive disturbances that usually accompany the operation of that medicine. The chief objection to its use was the very variable strength of the extract of hyoscyamus, as found in the shops, which often rendered it necessary to increase the quantity added to a given quantity of morphia in order to produce the desired action.

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* For these formulæ, see the passages cited in note §, p. 735, *supra;* for Philonium, see the same note. I may add that GALEN—*De simp. med. temp. ac fac.*, Lib. VIII, Cap. 20, [Ed. Kühn, XII, 147,]—described three varieties of hyoscyamus: one with black, a second with yellow and a third with white seeds. He commends the last only in medicine, declaring the two others to be poisonous. DIOSCORIDES—Lib. IV, Cap. 69, fol. 215, *op. cit.*, p. 623, *supra*—took the same view. According to him the seed, leaves and stems are all possessed of medicinal virtues, and he particularly lauded an extract prepared by drying in the sun the expressed juice of the whole plant. CELSUS used the leaves—Lib. VI, Cap. 6, Vol. II, p. 150, Ed. cited p. 656, *supra;* the seed—Lib. V, Cap. 25, same Vol., p. 49; the root—Lib. VI, Cap. 9, same Vol., p. 183; the juice—Lib. VI, Cap. 7, same Vol., p. 173; and a decoction—Lib. III, Cap. 18, Vol. I, p. 199.

† Cynoglossus pills are thus described by MESUE—*Grabadin*, Lib. I, Distinctio X, fol. 182, Opera, Venice, 1581: "Catapotia ad catarhum, coryzam, tussim, aliosque his succedentes affectus. Recipiunt myrrhæ, drach. vi. thuris drachm. v. opii, hyoscyami, ana drach. iiii. croci drach. i. et semissem, radicum linguæ canis, drach. iiii. et semiss. forma massam. Da a drach. semiss. ad drach. i." The commentator adds: "Has vocant aliqui alchaiber, alii de cynoglossa." It is not clear from this passage which variety of hyoscyamus or what preparation was used, but I suppose there can be little doubt that it was the seeds of the hyoscyamus albus, which were long used for this preparation. Indeed, as late as the beginning of the last century DALE—p. 181, *op. cit.*, p. 729, *supra*—writes of the hyoscyamus niger: "Internus ejus usus rarissimus est," and adds that the hyoscyamus albus is much milder and safer. According to QUINCY—p. 125, *op. cit.*, p. 730, *supra*—the composition of these pills was modified by FERNELIUS and RENODÆUS chiefly by the addition of castor and styrax, and it was from their writings that it was copied into the first dispensatory of the London College. He gives the formula as follows: "Take of the dried roots of hounds-tongue, [cynoglossus,] white henbane seeds and opium, each half an ounce; of mastich six drams; of olibanum five drams; of saffron, castor and styrax, each one dram and an half." I have said in the text that this formula is still preserved in the French Codex of 1866: see p. 554 of that work. I may add that it is marked with a star to indicate—see p. 29—that it is one of those articles that every drug store should keep on hand. It differs from the formula of QUINCY, chiefly, in containing myrrh, but no mastich or styrax, and in being made into a pill-mass with honey. Like the ancient preparation, it is made from the seeds of the hyoscyamus albus, for the formula reads "poudre de semences de jusquiame;" and elsewhere we learn—p. 62—"quant aux semences de Jusquiame, les seules que l'on trouve dans le commerce sont toujours blanches et appartiennent à la Jusquiame blanche." It would be idle to attempt to cite all the writers who have commended this preparation in dysentery: I will merely refer to NICOLAUS PISO—p. 277, *op. cit.*, p. 665, *supra*, and SENNERTUS—T. III, p. 175, *op. cit.*, p. 645, *supra*—as examples. The latter classes it with Philonium and the various laudanums. SAVIGNAC—p. 384, *op. cit.*, p. 620, *supra*—speaks of it as "les pilules de cynoglosse, vieux remède dont les propriétés calmantes peuvent encore être mises à profit, et que j'ai prescrit quelquefois dans le cours de la dysentérie chronique." He gravely adds that he believes the root of cynoglossus in this preparation serves rather to give a name to the formula than to increase its activity. At the present time the hyoscyamus niger is generally employed: for its commercial history see the *Pharmacographia*—p. 416, *op. cit.*, p. 703, *supra*. It may be remarked in addition that the extract of hyoscyamus has occasionally been prescribed in dysentery as a substitute for opium. Thus C. C. MATTHÄI—*Ueber die epidemische Ruhr*, Hannover, 1797, S. 165–66—states that he employed it even more frequently than opium; so far from constipating, it favored the action of the purgatives administered; but he admits that it was very variable in its action, and that especially the fresh extract was more active than after it had been kept some time.

‡ Professor CARSON used pills containing each ¼ of a grain of muriate of morphia and 2 grains of extract of hyoscyamus. One of the cases, in which I saw him employ them, made a deep impression upon my mind. It was an abscess in the abdominal walls over the region of the spleen, which I witnessed during the winter of 1858–59. The patient, a delicate young woman, happily delivered a few weeks before of her first infant, suffered excruciating pain, as I now suppose, from local peritonitis. The nature of the tumor, which speedily made its appearance, was not recognized for nearly three months, although several distinguished physicians and surgeons were called in consultation. At length fluctuation was recognized; the abscess was opened by Professor H. H. SMITH, and the patient made a speedy recovery. Professor CARSON attended this case with me, and, during three months of great suffering, kept the patient comfortable by the nightly administration at first of one, then of one and a half, and finally of two of the pills just described. Her bowels were seldom constipated, and then laxatives always acted readily. I note that T. H. TANNER—*The Practice of Medicine*, 5th American Ed., Philadelphia, 1870, p. 1104—commends a similar formula: "℞. Extracti opii gr. 1–4, vel morphiæ hydrochloratis, gr. ¼–1; extracti hyoscyami, gr. 5. Make into two pills, to be taken at bedtime. For the relief of severe pain, and to afford sleep in lingering diseases." A combination of acetate of morphia with extract of hyoscyamus was commended by the same author in his *Manual of the Practice of Medicine*, 1st American from the 3d London Ed., Philadelphia, 1858, p. 367.

The experiments of Harley* were quite in accord with this experience, and led him to the conclusion that opium prolongs and intensifies the effects of hyoscyamus, while hyoscyamus increases the hypnotic action of opium, and to a certain extent is able to avert the derangement of the vagus nerve, which is frequently the first effect of that drug. Recent physiological and chemical researches with regard to hyoscyamus, stramonium and belladonna seem, however, to render it more and more probable that the active principles of these drugs are after all identical;† and it will be shown further on that during the last ten years clinical experience with regard to the combined action of atropia and morphia seems to show that a mixture of these two alkaloids may be advantageously substituted for the more uncertain combination of morphia with extract of hyoscyamus.

Another drug of this class, occasionally used in the treatment of the fluxes, is *belladonna*. Conrad Gesner wrote from Zurich, in 1564, to his friend Achilles P. Gasser, that the inspissated juice of the fruit of this plant cures dysentery.‡ More than a century later J. L. Hannemann published in the German Ephemerides an account of the success of a certain Danish clergyman, who treated the cases of dysentery occurring in his parish with wine in which the same fruit had been infused.§ These observations were cited by Mangetus and Murray,‖ but do not appear to have attracted much attention until Bayle, in 1830, borrowed them from the work of Murray, and enumerated dysentery among the affections that belladonna cures.¶ Rognetta in 1838 repeated this statement on the authority of Bayle,** and in consequence of the publicity given to it by these two works a number

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* Harley—p. 341 *et seq.*, *op. cit.*, p. 746, *supra*.

† On this subject see K. D. Schroff—*Ueber Hyoscyamin*, Wochenblatt der Zeitschr. der k. k. Gesellschaft der Aerzte zu Wien, Jahrg. II, 1856, S. 389 *et seq.*; G. Lemattre—*Recherches exp. et cliniques sur les alcaloïdes de la famille des solanées*, Arch. Gén. de Méd., T. VI, 1865, p. 39 *et seq.*; Harley—Chap. 8, p. 321 *et seq.*, *op. cit.*, p. 746, *supra*; Ch. Laurent—*De l'hyoscyamine et de la daturine*, Paris Thesis, No. 155, 1870; M. Hellmann—*Beiträge zur Kenntniss der phys. Wirkungen des Hyoscyamins und der Spaltungsproducte des Hyoscyamins und des Atropins*, Inaug. Diss. Jena, 1873. These observations show, to say the least, the great similarity of the effects upon the animal organism produced by hyoscyamia, daturia and atropia. Their effect upon the pupil, the respiration, the circulation, the motor nerves and reflex irritability appears to be the same. Some of the earlier of the authors cited, while admitting this similarity of their action, sought to demonstrate characteristic differences, for the most part, however, only quantitative; but their testimony in this direction is so contradictory as to make it probable the differences they observed were dependent merely on the relative purity of the samples used. Thus Schroff—S. 428, *op. cit.*—found hyoscyamin the most active of the series in its local effect upon the pupil, while Lemattre—p. 54, *op. cit.*—found atropia the most active of the three, and daturia next. More than all this, the experiments of Hellmann—*op. cit.*—seem to show that the similar chemical derivatives (Spaltungsprodncte) of hyoscyamia and atropia are identical in their effects upon the organism. With regard to the chemistry of these alkaloids and their derivatives, see A. v. Planta—*Unters. über die Zusammensetzung einiger natürlichen organischen Salzbasen*, Annalen der Chemie u. Pharmacie, Bd. LXXIV, 1850, S. 245. Note particularly his analyses of daturin and atropin, from which he was led to identical formulæ for the two alkaloids. K. Kraut—*Ueber das Atropin*, same Jour., Bd. CXXVIII, 1863, S. 280, Bd. CXXXIII, 1865, S. 87, and Bd. CXLVIII, 1868, S. 236. W. Lossen—*Ueber das Atropin*, same Jour., Bd. CXXXI, 1864, S. 43, and Bd. CXXXVIII, 1866, S. 230. H. Hœhn u. E. Reichardt—*Ueber Gewinnung und Zusammensetzung des Hyoscyamins*, same Jour., Bd. CLVII, 1871, S. 98. These investigations show that hyoscyamia can be broken up by the action of various acids and bases, especially caustic baryta, into a base, hyoscia, and an acid, hyoscin acid. In the same way atropia is broken up into tropin and tropic acid. The two acids appear to be identical in composition, while the two bases appear, like hyoscyamia and atropia, themselves to differ by the presence in the latter of two additional equivalents of carbon, a difference which perhaps may disappear on further investigation. On the basis of the chemical facts, so far as known, and of his own experiments on animals, R. Buchheim—*Ueber die pharmakologische Gruppe des Atropins*, Archiv für Exp. Path. u. Pharmakologie, Bd. V, 1876, S. 463 *et seq.*—has suggested that the drugs hyoscyamus, stramonium and belladonna, and their alkaloids may hereafter be classed together as *the atropia group:* see also, by the same author, *Lehrb. der Arzneimittellehre*, 3te Aufl., Leipsic, 1878, S. 478 *et seq.*

‡ Conrad Gesner—*Epist. Med.*, Zurich, 1577, Lib. I, fol. 34—called the plant Solanum Sylvaticum, and wrote: "Succum ex ejus fructibus (acinis, qui cerasa referunt) expressum et ad syrupi consistentiam cum pauco saccharo decoctum, ita efficacem esse, ut vel ligulæ, aut cochlearii parvi mensura somnum inferat, fluxiones sistat, dolores tollat, dysenteriam curet, gratus est plane, sed cavendum ne amplius detur, ego cum laude usus sum." This observation is cited among others by J. M. Faber—*Strychnomania*, Augsburg, 1677, pp. 23 and 48. According to the testimony of G. J. Welsch—*De vena medinensi*, Augsburg, 1674, Cap. 10, p. 270—Gasser prudently abstained from trying the new remedy.

§ J. L. Hannemann—*De dysenteria feliciter curata*, Ephem. Med.-Phys. German, Dec. II, an. III, 1684, Obs. 64, p. 154: "Hanc nostram Chersonesum Cymbricam plurimis in locis infestat dysenteria: adversus hunc morbum contumacissimum et contagiosissimum quidam Pastor in parochia sua decumbentibus summo cum fructu et successu propinavit vinum, cui infusæ sunt baccæ Solani, non solum enormem fluxum sistnot, dolorem demulcent, verum malignitatem in sudorem resolvunt." L. Schröck, in his scholium to this observation, declared that, notwithstanding the reluctance of Gasser, he himself should not hesitate to give this drug in suitable doses in the absence of other medicines. This observation and that of Gesner have generally been understood to refer to our atropia belladonna, which was formerly known as the solanum lethale: see Mangetus—T. II, p. 863, *op. cit.*, p. 736, *supra*, Art. "Solanum lethale dictum Bella Donna." The resemblance of its berries to cherries, mentioned by Gesner, is repeated by Stillé—Vol. I, p. 897, *op. cit.*, p. 711, *supra*.

‖ Mangetus—*loc. cit.*, last note. J. A. Murray—*Apparatus Medicaminum*, Vol. I, Gottingen, 1776, p. 432.

¶ A. L. J. Bayle—*Bibl. de Thérapeutique*, T. II, Paris, 1830, p. 380—professedly borrowed the article in which the observations of Gesner and Hannemann are cited from the work of Murray, whose Latin he evidently did not very well understand, for he makes the "pastor" of Hannemann "un berger danois," and on p. 514, attributes to Gesner the cure of "une dyssenterie intense."

** Rognetta—*Mém. sur les vertus thér de la bel'adone*, Gaz. Méd. de Paris, T. VI, 1838, p. 584.

of physicians were induced to try the remedy. Fouquet found no benefit from its use.* Vogt thought small doses of the extract might sometimes be employed to relieve the tormina when it was desired to avoid the constipating effect of opium, and that in large doses it was preferable to opium for the relief of the vesical tenesmus.† Leclerc, during an epidemic of dysentery which prevailed in the garrison of Tours in 1836, applied large belladonna plasters to the abdomen with alleged advantage.‡ Savignac gave the extract internally with such excellent effect that he expresses wonder that it has not been more generally used. He particularly emphasized the circumstance that it did not tend to constipate the bowels, but on the contrary favored their action.§ A few years since Schwalbe employed sulphate of atropia internally for the relief of the tenesmus in the dysentery of Costa Rica, and with good results.‖

All these observations refer to the employment of belladonna or its alkaloid uncombined with other narcotics. But it is not in this way that the greatest advantage is probably to be expected from its use. Clinical experience as well as experiments on healthy human individuals indicate that, administered by itself, it is far inferior to opium in efficacy and certainty, whether as an anodyne or a hypnotic;¶ and for these purposes, therefore, it could not be judiciously substituted for opium or morphia in the treatment of the fluxes. But constantly accumulating evidence seems to indicate that a combination of the two drugs, and especially, in view of the uncertain strength of the extract of belladonna, a combination of the two alkaloids might often be employed with benefit in these diseases.

After the publication of the observations of Lipp and Anderson, a belief that these medicines were mutually antagonistic arose in many quarters, which undoubtedly retarded the recognition of the advantages of combining them. But numerous experimental researches

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* A. FOUQUET—*De la Dysenterie*, Vannes, 1852, p. 152: "J'ai expérimenté a petites doses la belladonne dans la dysenterie; mais je n'en ai retiré aucun effet avantageux."

† VOGT—S. 187 u. 219, *op. cit.*, p. 645, *supra*.

‡ The experience of LECLERC has been reported by A. ANSALONI—*De la médication de la dysentérie aiguë épidémique, et d'un procédé thérapeutique pour arrêter le ténesme*, Paris Thesis, No. 39, 1859, p. 18 *et seq.* It was founded upon the belief that the tenesmus of dysentery is of a neuralgic nature, that it exercises a prejudicial influence upon the progress of the inflammation, and that the solanaceæ are excellent remedies in neuralgic affections. He applied to the abdomen a large plaster of the extract of belladonna, which he renewed every twenty-four hours. Sometimes he substituted for it the extract of stramonium. At the same time he administered calomel in broken doses internally, and in the more advanced stages of the disease nitrate of silver and opium. BARRALLIER—p. 773, *op. cit.*, p. 603, *supra*—reports that, imitating LECLERC, he habitually employed an ointment composed of extract of belladonna and lard for the relief of the tenesmus and abdominal pain of dysentery.

§ SAVIGNAC—p. 380, *op. cit.*, p. 620, *supra*—gave 10 to 20 centigrammes of the extract in the form of pills, and declared that it calmed the pains as well if not better than opium.

‖ C. SCHWALBE—*Klima und Krankheiten der Republik Costarica*, Deutsches Archiv für Klinische Med., Bd. XV, 1874–5, S. 171. He dissolved one centigramme of sulphate of atropia in 180 cubic centimetres of distilled water, and gave, when the tenesmus was severe, a teaspoonful every half-hour until dilatation of the pupil and dryness of the throat ensued. This method, he remarks, is far preferable to the application of a belladonna plaster to the abdomen for the same purpose.

¶ When belladonna or atropia, in full but not poisonous doses, is administered to a healthy person, it produces dilatation of the pupil, a sense of dryness in the mouth and throat and of burning in the skin; considerable debility, restlessness, headache and mental disturbance follow. Hallucinations are usual; often the patient is sleepless, or, if he sleeps, is disturbed with delirious dreams; sometimes, however, stupor is produced. See, for testimony with regard to these phenomena, C. D. SCHROFF—*Ueber Belladonna, Atropin und Daturin*, Zeitschr. der k. k. Gesellschaft der Aerzte zu Wien, Jahrg. VIII, 1852, Bd. I, S. 215 *et seq.*; HARLEY—Chap. 5, p. 238 *et seq.*, *op. cit.*, p. 746, *supra*; H. NOTHNAGEL—S. 57, *op. cit.*, p. 746, *supra*; STILLÉ—Vol. I. p. 900 *et seq.*, *op. cit.*, p. 711, *supra*; R. BUCHHEIM—*Lehrb. der Arzneimittellehre*, *loc. cit.*, p. 752, *supra*. FRONMÜLLER—*Weitere Unters. über die schlafmachende Kraft der Narcotica*, Deutsche Klinik, Bd. XVII, 1865, S. 381 u. 382—declared that atropia was unsuitable for use as a narcotic, and that he regarded its use for this purpose as dangerous; the same opinion is repeated in his later work, *Klinische Studien über die schlafmachende Wirkung der narkotischen Arzneimittel*, Erlangen, 1869, S. 88 u. 89. A. I. MEURIOT—*De la méthode physiologique en thérapeutique et de ses applications a l'étude de la belladonna*, (a work rich in the bibliography of the subject,) Paris Thesis, No. 68, 1863, p. 110—summed up the testimony accessible when he wrote in the following forcible words: "On a longtemps employé, en médicine, la belladonne comme narcotique, mais il est aujourd'hui reconnu que cette plante produit de la stupeur, du coma et non du sommeil." Subsequent experience has only served to confirm this opinion. As to its anodyne effects, the testimony is more contradictory. A vast number of observations might be collected to show its efficacy in the relief of neuralgia. HARLEY—Chap. VI. p. 268, *op. cit.*—indeed, goes so far as to declare, "In painful affections of the nerves, whether arising from functional disorder or inflammatory action, atropia used subcutaneously is the most valuable remedy that we possess. In my hands it has never failed to bring relief, and in all cases but one has finally removed the affection." On the other hand, S. WEIR MITCHELL, W. W. KEEN and G. R. MOREHOUSE—*On the antagonism of atropia and morphia*, &c., Amer. Jour. of the Med. Sci., Vol. L. 1865, p. 75—testify, on the basis of numerous hypodermic injections, that while morphia thus used is of the utmost value as an anodyne, "conia, atropia and daturia have no power to lessen pain." H. C. WOOD—p. 249, *op. cit.*, p. 675, *supra*—referring to the great clinical experience of MITCHELL, especially in nervous affections, writes: "Dr. Mitchell has had probably the best opportunities ever afforded for testing this, and he says decidedly that it [atropia] is of little use in severe suffering." WOOD adds that his own experience is to the same effect, and that although he admits it to be frequently useful in neuralgia, he believes that "belladonna is almost immeasurably below opium as an analgesic."

have established the fact that this antagonism is by no means such that the medicinal effects of the one are completely neutralized by those of the other;* on the contrary, it appears to be pretty well demonstrated that the addition of atropia renders it possible to use smaller doses of morphia, and obviates some of its objectionable tendencies. Brown-Séquard

* It would be out of place to attempt here a complete discussion of the question of the alleged antagonism between belladonna and opium, but a notice of the more important works on the subject and a few remarks seem called for. Attempts have been made to assign an antiquity to this notion which does not appear to be proven by the literature of the subject. G. GIACOMINI—*Trattato Filosofico-Sperimentale dei Soccorsi Terapeutici*, (1833-38;) I cite Opere, Vol. VII, Padua, 1854, p. 356—has stated that it was observed by PROSPER ALPINUS and DE LOBEL that, when united with opium, belladonna has a milder action: "Infatti erasi notato da Prospero Alpino e da Lobel, che unita all'oppio la belladonna ha azione più mite." The treatise of GIACOMINI was translated into French by MOJON and ROGNETTA, and from this source—translation cited Ed. of 1842, p. 537—the statement just mentioned has been copied by NORRIS, FERRAND, CAMUS, ERLENMEYER and some other writers—cited *infra*—without any question. I have taken some trouble to verify this statement, but without success. GIACOMINI cites PROSPER ALPINUS—*De Plantis Ægypti*, Cap. 42, p. 51—without mentioning the edition. Of this work I have carefully examined the Venice edition of 1592, and find on the folio cited the statement that the Egyptians use the solanum somniferum for procuring sleep, and in various diseases, but not the slightest reference to the effects of combining it with opium is to be found in any part of the chapter referred to. Moreover I have vainly searched the *Medicina Ægyptiorum*, Leyden Ed. of 1719, of PROSPER ALPINUS, especially Lib. IV, for the expression of any such opinion, and I suspect the learned Italian has in some way fallen into error. As to DE LOBEL, he does not give any reference, but I suppose him to refer to the joint work of this author and PENA—vide *infra*—which, however, merely mentions, among other alleged antidotes, the famous alexipharmic theriaca. WM. F. NORRIS—*Cases of opium poisoning treated by belladonna, with remarks*, The Amer. Jour. of the Med. Sci., Vol. XLIV, 1862, p. 395 *et seq.*—has brought forward observations from the works of PETRUS PENA et MATTHIAS DE LOBEL—*Stirpium Adversaria Nova*, London, 1570-71, p. 103; G. HORSTIUS—*Opera Med.*, Nuremberg, 1660, T. II, Lib. X, Obs. 4, p. 488; and J. M. FABER—*Strychnomania*, p. 18 *et seq.*, *op. cit.*, p. 752, *supra*—to prove that "a knowledge of the antagonistic powers of opium and belladonna seems also to be of early date." But these observations, which I have carefully examined in the editions just cited, do not fairly bear any such interpretation. They contain, it is true, accounts of a number of cases in which the poisonous effects of belladonna were combated among other remedies by theriaca; and I may add that GIACOMINI—*loc. cit.*—has correctly cited THEOPHILUS BONETUS—*Polyalthes*, Geneva, 1694, T. III, p. 575—as having in a more general way commended "alexipharmics" for the same purpose. For in truth in those days theriaca was regarded as an alexipharmic and antidote to the poisons generally, and it was not to the opium it contained, but to the whole mixture, vipers' flesh and all—see p. 730, *supra*—that its virtues were supposed to be due. NORRIS adds that FABER also cites a case from BROTBEQUIUS "of a similar kind, in which recovery took place after the exhibition of opium"—p. 400, *op. cit.* I have carefully examined this case in the work of FABER—Obs. XV, pp. 25-6, *op. cit.*—only to find that the preparations actually administered were compounded from theriaca and bezoar, "adhibitis theriacalibus et bezuardicis," so that the same criticism applies to this case as to the others. And this is also true of the next set of observations brought forward by NORRIS, viz., those of BOUCHER—*Sur cinq enfans empoisonnés par des fruits de bella-donna*, Jour. de Méd., Chir., Pharm., &c., T. XXIV, 1766, p. 310 *et seq.* The substance of this paper is correctly given by NORRIS, although he had not seen it, but borrows his statement from GIACOMINI. Emetics, purgatives, enemata, and above all vinegar, which he regarded as the true antidote, were the remedies used by BOUCHER: "Il paroît vérifié que les acides végétaux sont l'antidote du poison de la bella-donna et des plantes venéneuses de la même classe; et tout concourt à donner la préférence au vinaigre"—p. 328. NORRIS adds: "In two cases, however, one of which was in a state of coma, and the other delirious, preparations of opium were administered." This statement does not bear comparison with the original paper. The two patients referred to—"le petit Courat" and "la petite Margousia"—p. 316—received, it is true, after they had been sufficiently vomited and purged, a "mixture cordiale" composed of eau thériacale, the distilled water of linden flowers, &c. Now I need hardly remind the reader that eau thériacale, our old aqua thericalis or treacle water—see p. 729, *supra*—was a distillate in which the opium was left behind in the still. The particular form of treacle water which BOUCHER used was probably that described in the 5th edition of LEMERY—*Pharmacopée Universelle*, Paris. 1761, p. 593—to which the reader is referred. I am therefore unable to acknowledge that the evidence brought forward shows the suggestion that opium may be used as an antidote in belladonna poisoning to be any older than the dissertation of J. LIPP, (J. H. F. AUTENRIETH, Præs.)—*De veneficio baccis belladonnæ producto atque opii in eo usu*, Tubingen, 1810—who, in the treatment of several cases of poisoning by belladonna berries, after first thoroughly evacuating the alimentary canal with emetics and purgatives, essayed the use of opium (in the form of Sydenham's laudanum) with apparent advantage—p. 4 *et seq.* Others were not slow in imitating this practice, for GIACOMINI in his article on opium—*op. cit.*, T. IV, Padua, 1853, p. 344—states that many Italian physicians had employed that drug in poisoning by belladonna, stramonium and hyoscyamus, and have seen the sopor dissipated, the delirium and convulsions calmed. The conception of a mutual antagonism between the two drugs appears to have originated in the suggestion of CORRIGAN, reported by GRAVES—*On the state of the pupil in typhus, and the use of belladonna in certain cases of fever*, The Dublin Jour. of Med. Sci., Vol. XIII, 1838, p. 351 *et seq.*—that narcotics which produce dilatation of the pupil (*e. g.*, belladonna) might prove advantageous in those cases of fever in which the pupil is contracted. GRAVES elaborated from this suggestion the doctrine that there are two kinds of cerebral excitation, very different in their nature, one attended with dilatation, the other with contraction of the pupil; opium may be advantageously used in the first, belladonna or stramonium in the second. It was this doctrine that suggested, as he himself tells us, to THOMAS ANDERSON—*On the influence of belladonna in counteracting the poisonous effects of opium*, The Monthly Jour. of Med. Sci., (Edinburgh,) Vol. XVIII, 1854, p. 377—the use of belladonna in opium poisoning, which he appears to have been the first to essay. After this date cases of opium poisoning treated by belladonna and of belladonna poisoning treated by opium multiplied in the journals. A number of them have been collected by NORRIS—*op. cit.*—who has also recorded two cases observed by himself, and concludes, "that in opium poisoning, belladonna in doses which in a state of health would certainly poison, may be administered with impunity and be followed by a rapid subsidence of the symptoms produced by the exhibition of the former drug, and *vice versa* that opium rapidly and safely counteracts the poisonous influence of belladonna." This paper of NORRIS and a previous one by C. C. LEE—*On the antagonistic effects of opium and the mydriatics*, The Amer. Jour. of the Med. Sci., Vol. XLIII, 1862, p. 54 *et seq.*—were made widely known in Europe through an abstract published in the Archives Gén. de Méd., T. III, 1864, p. 575, and gave rise to a good deal of discussion and experiment. The more important subsequent studies are those of E. CAMUS—*Étude sur l'antagonisme de l'opium et de la belladonne*, Paris Thesis, No. 124, 1865; MITCHELL, KEEN and MOREHOUSE—*op. cit.*, last note; FERRAND—*De l'antagonisme de l'opium et de la belladonne*, Bull. Gén. de Thér., T. LXX, 1866, p. 494 *et seq.*, (historical and critical;) ERLENMEYER—*Der Antagonismus zwischen Atropin und Morphium*, Berliner Klin. Wochenschrift, Jahrg. III, 1866, S. 13; HARLEY—Chap. VII, p. 269 *et seq.*, *op. cit.*, p. 746, *supra*; H. C. WOOD—*Contribution to our knowledge of the phys. action of atropia*, The Amer. Jour. of the Med. Sci., Vol. LXV, 1873, p. 332; J. HUGHES BENNETT—*Report of the committee of the British Med. Ass. to investigate the antagonism of medicines*, British Med. Jour., 1874, Vol. II, p. 436 *et seq.*, reprinted as *Researches into the antagonism of medicines*, London, 1875; and H. HEUBACH—*Antagonismus zwischen Morphin und Atropin*, Archiv für Exp. Pathologie u. Pharm., Bd. VIII, 1877, S. 31. These investigations contradict each other as to many particulars in a manner that may seem to indicate the difficulty of the inquiry. It would carry me too far from my present purpose to enter into a discussion of details; let it suffice to express my admiration of the work of the Bennett committee, who conclude—p. 54, reprint cited *supra*—"that in dogs sulphate of atropia modifies the symptoms of poisoning by meconate of morphia, diminishes their intensity, and may even save life after a fatal dose of the latter. It is therefore decidedly antagonistic, but within a limited area." But I cannot agree with the subsequent remark that "in man, sulphate of atropia would be too dangerous and uncertain a remedy to depend on in cases of poisoning by opium or any of its salts, but where the heart's action is greatly diminished it is directly indicated," unless it is merely intended as a warning not to depend upon atropia alone or give it in poisonous doses. On the contrary, I agree with H. C. WOOD—p. 250, *op. cit.*, p. 675, *supra*—that the reported cases are sufficient to "establish the therapeutic value of atropia in opium poisoning," and that it should almost always be employed in the advanced stages of that accident, especially when the progressive failure of the respiratory function threatens a fatal issue.

stated, in 1868, that, more than seven years before, he was induced by theoretical considerations to use hypodermic injections in which morphia and atropia were combined, and he claimed for this method not merely an increased anodyne effect, but the possibility of employing safely, or at least without great or lasting cerebral or cardiac disturbances, large doses of these narcotics.* Harley was led by his investigations to conclude that the addition of atropia increases the hypnotic and anæsthetic effects of a given quantity of opium, while it obviates the tendency to constipation and other injurious effects. He especially advised the employment of this combination in the early stages of inflammatory diseases, and in the treatment of neuralgia and insomnia. Indeed, he expressed the opinion that by this plan persons who cannot otherwise endure a dose of opium may be brought under its beneficial influence, and that morphia as a rule should not be injected alone, unless previous experience has shown that the patient will suffer no ill effects.† These results are in accordance with our knowledge of the effects upon animals of moderate doses of atropia, which appear to produce contraction of the peripheral bloodvessels, augment the arterial pressure,‡ increase the frequency and force of the heart's action,§ the peristaltic motion of the intestines,‖ and the secretion of the urine.¶ Overwhelming doses, it is true, produce opposite effects, but this should only suggest caution as to the dose employed.

Accordingly the use of atropia and morphia combined, and especially hypodermically, has during the last few years become more and more frequent in general practice,** and I

* C. E. BROWN-SÉQUARD—*Lectures on the diagnosis and treatment of functional nervous affections*, Philadelphia, 1868, p. 72: "More than seven years ago, I was led, by the knowledge of the antagonistic effects of morphin and atropine on the brain, to inject these two agents together, so as to reap the benefit of the therapeutic effects of the one added to those of the other against pain. * * * I now employ from one-half to two-thirds of a grain of the sulphate of morphia with one twenty-fifth of a grain of the sulphate of atropine." A. RUPPANER—*Hypodermic Injections*, Boston, 1865, p. 31, note—testifies to the use of this combination by Dr. BROWN-SÉQUARD at that time.

† HARLEY—pp. 300–302, *op. cit.*, p. 746, *supra*—adds to the remark referred to in the text: "To counteract those distressing and sometimes dangerous effects which follow the subcutaneous use of morphia, combination with $\frac{1}{30}$ of a grain of sulphate of atropia will usually be sufficient."

‡ The results of experiments on this subject are by no means wholly accordant, which appears to a great extent to have happened from the circumstance that sufficient care has not always been taken to discriminate between the effects of moderate and toxic doses. I am quite willing to admit that the phenomena observed by WHARTON JONES—*On the uses and action of belladonna in ophthalmic practice*, Med. Times and Gaz., 1857, Vol. I. p. 27 *et seq.*—who saw the local application of a solution of atropia to the frog's web followed by contraction of the small arteries, may be explained in part by a reflex action resulting from the local irritation, as seems to be shown by the investigations of THOMAS HAYDEN—*On poisoning with the berries of atropa belladonna*, &c., The Dublin Quarterly Jour. of Med. Sci., Vol. XXXVI, 1863, p. 51, and MEURIOT—pp. 44–45, *op. cit.*, p. 753, *supra*; and I am inclined to give full weight to the opinions of A. v. BEZOLD u. F. BLOEBAUM—*Ueber die phys. Wirkungen des schwefelsauren Atropins*, Unters. aus dem physiologischen Laboratorium in Würzburg, Theil 1, Leipsic, 1867, S. 52—who concluded from their experiments that atropia diminishes and destroys the irritability of the vaso-motor nerve centres. But it nevertheless seems probable, as MEURIOT himself concludes—p. 48 *et seq.*, *op. cit.*—that the first effect even of atropia poisoning is a moderate contraction of the peripheral bloodvessels and no acceleration of the bloodstream; and this opinion is also supported by the observations of HARLEY—p. 219 *et seq.* Further support to this view is afforded by the increased arterial pressure consequent upon moderate doses. BEZOLD u. BLOEBAUM—S. 51, *op. cit.*—found that small doses of the poison increased the arterial pressure, although large doses diminished it. H. C. WOOD—*Contribution*, &c., cited p. 754, *supra*—observed this rise in pressure even after the section of the vagus. In fact, as the latter writer very clearly indicates—p. 233 *et seq.*, *op. cit.*, p. 675, *supra*—in moderate doses atropia stimulates the vaso-motor centres, while in larger doses after a time it paralyzes them. Given in appropriate doses, therefore, it seems well calculated to counteract the effects of morphia on the blood pressure and vaso-motor centres: see note †, p. 744, *supra*.

§ The action of atropia on the heart also varies with the dose. There seems to be no doubt that in poisonous doses it paralyzes the heart's action: see in support of this statement especially S. BOTKIN—*Ueber die physiologische Wirkung des schwefelsauren Atropins*, Virchow's Archiv, Bd. XXIV, 1862, S. 88; BEZOLD u. BLOEBAUM—S. 46, *op. cit.*; and MEURIOT—p. 64 *et seq.*, *op. cit.* On the other hand, moderate doses appear to increase the frequency and force of the heart's action: see BEZOLD u. BLOEBAUM—S. 33–34, *op. cit.*; MEURIOT—*loc. cit.*, note especially the sphygmographic traces published by this author; and HARLEY—p. 221, *op. cit.*

‖ As to the action upon the peristaltic movements of the intestines, BEZOLD u. BLOEDAUM—S. 65, *op. cit.*—state that by small doses the irritability of the muscular coat is diminished, by large doses paralyzed. They affirm that when they opened the abdomens of dogs or rabbits, into whose veins from a few milligrammes to a decigramme of atropia had been injected, they always observed an unwonted condition of rest in the viscera. On the other hand, MEURIOT—p. 107, *op. cit.*—testifies that when the belly, even of an animal poisoned with a large dose of atropia introduced into the stomach or rectum, is opened, the peristaltic movements of the intestines are seen to be exaggerated in a marked degree. At a subsequent period, however, he admits that if the dose be large, paralysis follows these excessive movements; and this, I suppose, explains the contrary observations of BEZOLD and BLOEBAUM, for certainly the doses they mention are for dogs and rabbits very large, and being injected directly into the veins, may even have paralyzed from the first. The investigations of P. KEUCHEL—*Das Atropin und die Hemmungsnerven*, Dorpat, 1868, S. 35 *et seq.*—seem to show that the increased peristaltic action is really due to paralysis of the inhibitory nervous apparatus of the intestines rather than to stimulation of the muscular fibres or their motor centres; but be this as it may, there seems to be little doubt as to the fact that the motion is increased in animals by moderate doses, and this accords with clinical observation on man, in whom constipation is often relieved by the action of this drug, and the constipating effect of opium generally neutralized, though it must be admitted that, as BUCHHEIM—S. 480, *op. cit.*, p. 746, *supra*—has remarked, medicinal doses seldom augment the movements of the intestinal canal sufficiently to produce diarrhœa.

¶ For the evidence on this head *vide* note †, next page.

** Among the earlier followers of BROWN-SÉQUARD in this matter I may mention R. BARTHOLOW—*Manual of hypodermic medication*, Philadelphia, 1859, p. 89 *et seq.* I am at the present time acquainted with a number of physicians who have long habitually employed the same combination.

am disposed to believe that this combination might advantageously be employed whenever hypodermic injections of morphia are indicated in the fluxes. For this purpose $\frac{1}{100}$th of a grain of sulphate of atropia with ¼th of a grain of sulphate of morphia is usually a suitable dose for adult males, and may be injected once or twice in the twenty-four hours or even oftener, as demanded by the urgency of the symptoms. It will, however, be perhaps best for the physician to keep separate solutions of the two sulphates, to be combined in various proportions in accordance as he may desire in different morbid states to produce more or less of the peculiar effects of either drug.* Nor do I doubt that a similar combination might often be administered internally with benefit in almost all the conditions in which the internal administration of morphia is indicated during the progress of dysentery or other acute fluxes.

Moreover, the action of atropia on the kidneys may perhaps be utilized in those cases of dysentery in which the secretion of urine is diminished or suppressed. It should be borne in mind that this action is probably dependent, to a great extent at least, upon the modification of the blood pressure produced by the drug, and that when this is lessened by the operation of excessive doses the secretion of the kidneys is diminished. It is useless, therefore, to attempt to produce the desired effect by increasing the quantity administered, if moderate doses fail to act. The interesting experiments of Harley relating to this subject cannot perhaps be regarded as fully establishing all the conclusions he has drawn from them, but they certainly indicate an important field of inquiry.†

The extract of *stramonium* has also been employed in dysentery; but as it has become of late exceedingly probable that the alkaloid to which this drug owes its virtues is very similar to atropia, if not identical with it, the question of its employment requires no discussion in this place.‡ Nor is there sufficient evidence in favor of the use of *dilute*

* The atropia solution may conveniently consist of one grain of the sulphate dissolved in five hundred minims (*i. e.*, one fluid ounce and twenty minims) of distilled water; the morphia solution, of eight grains of the sulphate dissolved in one fluid ounce of distilled water, which is the strength of the liquor morphiæ sulphatis of the U. S. Pharmacopœia. Five minims of the first solution will contain $\frac{1}{100}$ of a grain of sulphate of atropia, and fifteen minims of the second will contain ¼ of a grain of sulphate of morphia. The two together will make twenty minims, a very convenient quantity for a hypodermic injection. Some practitioners may prefer solutions of double this strength, to which I have no objections, provided sufficient care is taken in their preparation and use. Both solutions soon spoil in consequence of the growth of a penicilium, and should therefore not be kept for any length of time. As to the quantity of either salt that may safely be administered in this way, extraordinary differences of opinion have been expressed. Some physicians have, without hesitation, administered sulphate of atropia in doses which may well be called poisonous, if we judge from their own account of the effects produced: see on this subject, for instance, the authors cited by EULENBURG—S. 209 *et seq.*, *op. cit.*, p. 748, *supra*. The hypodermic use of morphia has, I fear, been equally abused. I am disposed to advise that, under ordinary circumstances, more than $\frac{1}{60}$ of a grain of sulphate of atropia should not be injected at once, and that the quantity used in the twenty-four hours should rarely exceed $\frac{3}{100}$ of a grain. As for the morphia, it is seldom advisable to give more than three-quarters of a grain in the twenty-four hours, and two quarter-grain doses will usually produce all the effect desirable, except in the case of those who have become habituated to its operation. But in using these drugs in the treatment of the fluxes the rule to administer no more than is imperatively demanded by the exigencies of each case should always be rigidly observed.

† HARLEY—Chap. V, p. 209 *et seq.*, *op. cit.*, p. 746, *supra*—states that atropia is freely eliminated by the kidneys. He convinced himself by placing between the eyelids a few drops of the urine of individuals who had received hypodermic injections of atropia; in 18 to 20 minutes after the injection of $\frac{1}{48}$ to $\frac{1}{50}$ of a grain of the sulphate he found this secretion would dilate the pupil: "Twelve drops of eight ounces of urine secreted during the action of the $\frac{1}{48}$ of a grain of the salt, are sufficient to dilate the human pupil from $\frac{1}{10}$ to $\frac{1}{8}$ of an inch in diameter, and maintain it thus dilated for 8 or 10 hours." Or the atropia may be separated from the urine by agitating it with chloroform, allowing the latter to evaporate spontaneously, and dissolving the residue in a few drops of water, which may be tested by placing it between the eyelids. He concludes that "the fullest medicinal doses are wholly removed by the kidneys alone," and that "belladonna indeed is, in the truest sense of the word, a diuretic, and more powerful perhaps than any other that we possess"—p. 213. According to his observations the urinary secretion in a given time is more than doubled by its action, while the specific gravity is only diminished a third; there is therefore an increase in the solid constituents eliminated, which increase, his analyses showed, was slight for the urea and chlorine, great for the phosphates and sulphates. He therefore strongly commended the use of belladonna or its alkaloid both in acute nephritis and in chronic albuminuria—p. 253 *et seq.* According to MEURIOT—p. 120, *op. cit.*, p. 753, *supra*—moderate doses of atropia increase the secretion of urine because they increase the arterial pressure; but when, in consequence of toxic doses, the arterial pressure falls, the urinary secretion diminishes or ceases. I doubt not that this explanation is correct; but if atropia is eliminated by the kidneys, as HARLEY seems to have proved, it may also exercise a directly stimulating effect on their functions. Investigations to settle this point are desirable. H. C. WOOD—p. 242, *op. cit.*, p. 675, *supra*—speaking of the action of small doses on the urinary secretion, writes: "I am confident, however, that this increase varies very much, and is not always marked," which is probably true; and I readily admit this whole question requires further careful study.

‡ That extract of stramonium has been employed in dysentery is testified by SAVIGNAC—p. 377, *op. cit.*, p. 620, *supra*, and BARRALLIER—p. 773, *op. cit.*, p. 603, *supra*. LECLERC—note ¹, p. 753, *supra*—sometimes applied it externally to the abdomen in lieu of belladonna. It enters into the compound recommended some years since by W. KERR—*On a new remedy for dysentery*, Edinburgh Med. Journal, Vol. X, Part 2, 1865, p. 1106—which contained seven ingredients, "four officinal, viz., opium, stramonium, dulcamara, digitalis; three non-officinal, sinn lineare, cicuta maculata, conioselinum canadense. All are more or less narcotic; and digitalis, dulcamara, and sinn lineare are also diuretic." With regard to the probable identity of daturia and atropia, see note †, p. 752, *supra*.

*hydrocyanic acid*,* or of the extract of *cannabis indica*,† in the treatment of the fluxes to make it important to do more than mention them here; together with morphia, chloroform and other ingredients, they are said to enter into the composition of *chlorodyne*, a nostrum which has enjoyed considerable reputation, especially in the British Empire, in the treatment of cholera and the fluxes generally.‡ This nostrum has recently been employed with alleged benefit in the diarrhœa of Cochin China by some of the French Naval surgeons.§

* This appears to have been first given in the form of cherry-laurel water, which is commended as an addition to clysters for the relief of tenesmus by NAUMANN—Ed. IV, Abth. 2, S. 91, *op. cit.*, p. 645, *supra*. J. ELLIOTSON—p. 1061, *op. cit.*, p. 267, *supra*—advised the administration of three or four drops of dilute hydrocyanic acid as a means of enabling the stomach to retain without nausea the pills of sulphate of copper and opium he employed in chronic dysentery. COPLAND—Vol. I, p. 729, *op. cit.*, p. 682, *supra*—remarks: "The prussic acid, with camphor, ipecacuanha, and mucilages, is of benefit when judiciously prescribed." VOGT—S. 187, *op. cit.*, p. 645, *supra*—refers to the use both of cherry-laurel water and hydrocyanic acid, but without praise. I am disposed to think that the dilute acid might prove occasionally useful to allay vomiting, when this symptom becomes troublesome during the progress of dysentery or other fluxes. Cyanide of potassium in the dose of $\frac{1}{25}$th to $\frac{1}{10}$th of a grain may be advantageously substituted in such cases as a more convenient equivalent.

† Cannabis indica has been but little used in the fluxes, and chiefly in combination with opium or other narcotics, as for example in chlorodyne—see next note. I know of no careful study of its peculiar effects in these diseases. As an anodyne and hypnotic it is far inferior to opium in efficacy and certainty, but has the advantage of not disordering the appetite or constipating. It may prove occasionally useful, especially in the chronic fluxes; but the very variable strength of the extracts in the market constitutes a serious objection to its use. See, particularly on the therapeutic value of this drug, FRONMÜLLER—S. 45 *et seq.*, *Klin. Studien*, cited p. 753, *supra*—who claims to have employed it in one thousand individuals suffering with various diseases—S. 61—and concludes that of all known narcotics it produces the most natural sleep without any injurious after-effects, and that it may be used in acute inflammatory disorders of every kind as well as in typhous conditions—S. 69. He admits, however, that its action is not so powerful or certain as opium.

‡ This is a proprietary medicine manufactured for one J. COLLIS BROWNE. Various formulæ supposed to approximate its composition have been published. If these can be at all relied upon the ancient superstitious veneration for the Theriaca of Andromachus is not yet dead; for it figures as an ingredient in several of these precious compounds. According to an article in the *Chemist and Druggist*, Vol. I, February, 1860, p. 115, "Chlorodyne was invented in the year '48 by Dr. Browne, whilst officiating in his medical capacity during the prevalence of cholera and diarrhœa among our troops in India, and was introduced to the notice of the faculty in this country by him as a 'combination of perchloric acid with a new alkaloid.'" In 1859 OGDEN published what purported to be an analysis of it—same Jour., Oct., 1859—but in the same Jour., Jan., 1860, he gave a somewhat modified formula. I have not seen these two articles, our library file of this journal being incomplete, and give OGDEN'S analysis from the February number cited above. Another formula was published by PETER SQUIRE—*Companion to the New Edition of the British Pharmacopœia*, 5th Ed., 1868, p. 80—who stated that it had been represented to him "as the composition of the popular medicine called chlorodyne;" and still another by EDWARD SMITH—*Pharmaceutical Journal and Transactions*, Vol. XI, 1869–70, p. 417. Others will be found in the journals, *e. g.*, in *The Doctor*, Vol. II, 1872, pp. 112 and 173; *The Druggists' Circular and Chem. Gazette*, Vol. XVII, 1873, pp. 79 and 128; and elsewhere. Among the most recent substitutes is the formula proposed by DOUNON—*op. cit.*, next note. As a matter of curiosity I give a few of the most prominent of these formulæ:

| INGREDIENTS. | OGDEN. | SQUIRE. | SMITH. | DOUNON. |
|---|---|---|---|---|
| Chloroform | ʒvj. | ʒiv. | f ʒiv. | 30 grammes. |
| Tincture of Capsicum | ʒss. | none. | f ʒvj. | 30 grammes. |
| Oil of Peppermint | gtt. iij. | m. xvj. | m. viij. | 30 grammes. |
| Muriate of Morphia | grs. viij. | grs. viij. | grs. xx. | 10 grammes. |
| Perchloric Acid | gtt. xx. | none. | none. | 30 grammes. |
| Scheele's Hydrocyanic Acid | gtt. xij. | none. | none. | none. |
| Dilute Hydrocyanic Acid | none. | ʒij. | f ʒiv. | 10 grammes. |
| Tincture of Indian Hemp | ʒj. | none. | none. | 20 grammes. |
| Theriaca, (Anglice, Treacle) | ʒj. | ʒiv. | f ʒiv. | none. |
| Ether | none. | ʒj. | f ʒij. | 20 grammes. |
| Alcohol, (dilute) | none. | ʒiv. | none. | none. |
| Extract of Glycyrrhiza | none. | ʒiiss. | none. | none. |
| Syrup | none. | ʒxviiss. | none. | none. |
| Mixture of Gum Arabic | none. | none. | f ʒj. | none. |
| Pure Molasses | none. | none. | none. | 200 grammes. |

I note that the first and last of these formulæ contain Indian hemp, while the others do not. In the two formulæ cited in *The Doctor*, tincture of lobelia is substituted for the hemp. The first of the formulæ cited in *The Druggists' Circular* contains Indian hemp, the second does not. All the English formulæ cited contain Theriaca, which in some of them is written treacle—see note ‖, p. 729, *supra*; in *The Druggists' Circular*, by a blunder which appears to result from ignorance, molasses is written instead, and DOUNON falls into the same mistake. I have not thought it worth while to make a list of all the numerous articles on the subject of chlorodyne which have appeared in the medical journals. A number of them will be found in the *Pharmaceutical Journal and Transactions*, especially in Vol. XI, 1869–70, *passim*. Several fatal cases resulting from its reckless use are reported by A. S. TAYLOR—*On Poisons*, &c., 3d Ed., London, 1875, Chap. 56, p. 568.

§ Chlorodyne appears to have been brought into use for this purpose by DOUNON—*Guide pratique pour le traitement par la chlorodyne de la diarrhée de Cochinchine et des affections parasitaires du tube digestif*, Nov., 1877, Ire Éd., Dec., 1877, 2e Éd.; I have not seen the paper, and cite from the critical review in the Archives de Méd. Navale, T. XXIX, 1878, p. 360. The connection between the pathology and treatment seems here not inappropriate: undemonstrated suppositions in the first, and a secret nostrum for the second. The author is quite sure that the Cochin China diarrhœa is due to NORMAND'S *anguillula*—see p. 372, *supra*—but he seems to have been himself a little ashamed of his English chlorodyne, for he speedily substituted for it an imitation chlorodyne prepared by a Toulon pharmacist, and then one devised by himself: see p. 370 *et seq.*, of the review, and p. 31 of CHASTANG'S paper, cited *infra*, also note ‡, *supra*, for the formula of DOUNON'S chlorodyne. E. CHASTANG—*Diarrhée dite de Cochinchine, quelques notes sur son origine parasitaire et son traitement par la chlorodyne*, same Jour., T. XXX, p. 29—denies that the anguillula is constantly present in this form of flux, which he does not think is caused by it. He was induced by DOUNON'S publication to try the English chlorodyne in a number of cases, and found, as might have been expected from its probable composition, that, although it generally diminished the number of stools, it did not cure, but sometimes aggravated the disease; and that in chronic cases relapses speedily followed the subsidence of the first impression of the English nostrum—p. 37. I may add in this place that since p. 372, *supra*, was stereotyped, I have read the paper of BAVAY—*Note sur l'anguillule intestinale*, same Jour., T. XXVIII, 1877, p. 64—which at that time I had not received, and several other essays on the same subject, viz., CHAUVIN—*L'anguillule stercorale dans la dysenterie des*

But all the objections to secret remedies, as a class, apply to this preparation, and all the criticisms that sound logic has offered with regard to ancient polypharmacy may be urged against the various formulæ which have been devised to imitate it; any serious discussion of its supposed virtues would be out of place in these pages.

More than twenty years ago Lownds and Stovell drew attention to the usefulness of *chloroform* in relieving the tenesmus of dysentery. They gave it internally in the dose of twenty minims. Morehead states that he has used it in several cases, and admits that its power of allaying the pain consequent on intestinal spasm is undoubted; but remarks that when repeated several times it is apt to create gastric irritation, indicated by a sense of heat at the epigastrium and a florid tongue, and expresses the opinion that it should therefore only be occasionally used.* Barrallier declares that chloroform can rarely be useful in dysentery because it lowers the temperature and augments the number of stools;† but he gives no authority for either statement. The first is probably based upon the well known fact that in profound chloroform-narcosis the animal temperature is lowered;‡ but I know of no evidence to show that any such effect occurs after the internal administration of suitable medicinal doses. I know not what observations may have suggested the second statement, which is rendered improbable by the well known action of the drug when administered to relieve the painful cramps that so often accompany acute intestinal catarrhs. In fact chloroform enters into the composition of several of the diarrhœa mixtures popular in this country, and while the vulgar practice of habitually resorting to preparations of this class deserves censure, it is exceedingly probable that the addition of chloroform increases their efficiency and diminishes the frequency of injurious after-effects.§

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*Antilles*, same Jour., T. XXIX, 1878, p. 154; NORMAND—*Du role étiologique de l'anguillule dans la diarrhée de Cochinchine*, same Jour., T. XXX, 1878, p. 214—who still maintains his theory; and the thesis of P. A. ROUX—*De l'anguillule stercorale et de son role dans l'étiologie de la diarrhée de Cochinchine*, Paris Thesis, No. 222, 1877—who hesitates to accept it, and calls for new researches. Several other essays are cited in the review referred to above, which I have not seen. The evidence, so far as it has come into my possession, strengthens the opinion expressed on pp. 372–3, *supra*, as to the significance of this parasite, and I note that the same view is taken in the review just mentioned.

* The volume of the *Transactions of the Medical and Physical Society of Bombay*, No. 3, for the years 1855–6, which contains the observations of LOWNDS and STOVELL, is unfortunately not in our library; I cite from MOREHEAD—p. 304, *op. cit.*, p. 657, *supra*—who concludes that "chloroform should, therefore, be only used occasionally, to relieve tenesmus or other symptoms of spasm of the muscular fibre of the intestine, when urgent;" but suggests in a foot note that the vapor of chloroform, introduced into the rectum, under the circumstances in which opiate enemata are usually employed, appears to be worthy of trial. G. MEAD—*Chloric ether; its properties and uses*, Association Med. Jour., 1854, Vol. II, p. 819 *et seq.*—had previously employed the so-called chloric ether in choleraic and other forms of diarrhœa, and in cholera.

† BARRALLIER—p. 774, *op. cit.*, p. 603, *supra:* "Le chloroforme est rarement utile dans la dysenterie, car il abaisse la calorification et augmente le nombre des évacuations."

‡ The principal authorities for this statement are DUMÉRIL et DEMARQUAY—*Rech. exp. sur les modifications imprimées à la température animale par l'éther et par le chloroforme*, &c., Archives Gén. de Méd., T. XVI, 1848, p. 192 *et seq.*, and J. SCHEINESSON—*Unters. über den Einfluss des Chloroforms auf die Wärmeverhältnisse des thierischen Organismus und den Blutkreislauf*, Inaug. Diss., Dorpat, 1868. The observations of both refer to the chloroform-narcosis produced by inhalation, carried in some of the experiments to a fatal issue; and the more elaborate studies described in the latter paper seem to show that the lowering of temperature depends on a diminished heat-production, resulting in part from the retarded circulation, in part from diminished tissue-metamorphosis—S. 82.

§ Diarrhœa mixtures containing chloroform have been used in the United States for more than twenty years. I well remember one containing, besides chloroform, the tinctures of opium, camphor, capsicum, kino, &c., which was in use in the medical wards of Blockley Almshouse as long ago as 1854, under the name of "mixture of seven," from the number of its ingredients. One of the most popular preparations of the sort is that proposed by Dr. E. R. SQUIBB—*Advice upon epidemic cholera*, New York, 1866—and designated "compound tincture of opium, or diarrhœa mixture." Proposed for use during the prevalence of epidemic cholera, it has since been extensively employed under other circumstances. It "is composed of tincture of opium, spirit of camphor, and tincture of capsicum, each one fluidounce, purified chloroform, three fluiddrachms, and a sufficient quantity of stronger alcohol to make the whole measure five fluidounces." The dose for persons over 18 years of age is a teaspoonful. The directions are that, "in time of epidemic cholera or diarrhœa when any person has two movements of the bowels more than natural within the 24 hours, the second one should be followed by a dose of this mixture, the dose to be repeated after every movement that follows. If the movements increase in frequency or in copiousness after the second dose of the medicine has been taken, a physician should be sent for at once, and a double dose be taken after each movement until he arrives. Immediately after taking the first dose, the person should go to bed, and remain there for 12 hours after the diarrhœa has entirely ceased." In the same pamphlet is reprinted the address to the public of the Metropolitan Board of Health of New York on the prevention of cholera, a part of which advises in cases of diarrhœa that "in the absence of a physician the adult can take ten drops of laudanum and ten drops of spirits of camphor," and that "these drops may be repeated every twenty minutes so long as diarrhœa or pain or vomiting continues." The attentive reader will readily understand how easy it would be to cite authorities either in favor of such a plan of treatment or against it. I believe the weight of the evidence is on the latter side. I cannot agree with my esteemed friend Dr. SQUIBB that whenever a person has two movements of the bowels more than natural within twenty-four hours he ought necessarily to take the diarrhœa mixture described above, or any other preparation containing opium. Still less do I think this treatment is wise during the epidemic prevalence of cholera, of diarrhœa or of dysentery, without the preliminary use of evacuants, or without the precautions insisted upon when opium was under discussion. At the same time, for those who insist upon resorting to opiates under these circumstances, I think Dr. SQUIBB's preparation better than laudanum alone, though I would fain omit from it both the capsicum and the camphor.

In dysentery, however, the effects of chloroform have not been sufficiently studied to warrant the expression of an opinion as to the extent of its usefulness. It is probable that, like atropia, the greatest benefits are to be expected from it when it is given in combination with morphia. Claude Bernard has shown that animals that have previously received small doses of morphia come much more readily under the influence of chloroform, smaller doses of which are sufficient to produce complete anæsthesia. This observation has already been utilized for surgery and obstetrics. It has been found possible, in the case of individuals who have previously received hypodermic injections of morphia, to produce complete analgesia without carrying the inhalation of the vapor to the point of producing unconsciousness;* but so far as I know no careful study of the combined effect of the internal administration of chloroform and morphia has as yet been undertaken.

If it should prove possible by this combination to relieve urgent pain and intestinal spasm with a smaller quantity of morphia than would otherwise be needed, it would be a valuable addition to our resources, even if the relief thus obtained were no more complete and certain than can be obtained by morphia alone. Moreover, the circumstance observed by Rutherford and Vignal, that chloroform is an energetic stimulant of the hepatic secretion is of precious significance in this connection, and indicates the propriety of combining chloroform with the morphia administered in acholic conditions.† The internal use of chloroform in connection with morphia for the relief of tenesmus and other forms of painful intestinal spasm seems, therefore, well worthy careful trial. The only probable difficulty that suggests itself is the irritability of the stomach in certain groups of cases. Further experience is required to show how far this constitutes an actual objection to its use, as well as to determine the question of dose. For preliminary experiments in this direction I should not hesitate, when pain is great, to exceed the dose employed by Lownds and Stovell, and to repeat it after an hour's interval, if relief were not afforded.‡

Cameron directed attention, in the year 1870, to the employment of *hydrate of chloral* in acute gastro-enteritis by the statement that he had cured two severe cases, each with a single dose.§ In 1875 Prince suggested the use of the same drug as a means of aborting acute dysentery. He gave it in sufficient dose to produce sleep; on an average thirty grains, with an ounce or two of sulphate of magnesia and enough water to make a solution. A dose of salts so small that it fails to secure a free watery discharge he regarded as worse than useless, and too small a dose of chloral as apt to produce troublesome delirium. I do not doubt that this treatment proved, in the cases referred to, as efficient as claimed; but there is nothing in the paper to show that these cases were other than mild catarrhal forms;

* Claude Bernard—Leçon 8, p. 225 *et seq.*, *op. cit.*, p. 746, *supra*. In this lecture the reader will find references to the earlier application of the method to surgery and obstetrics. In cases of labor, Guibert injected 1 to 2 centigrammes (about ⅛ to ¼ of a grain) of morphia subcutaneously, and then found that the inhalation of extremely small quantities of chloroform vapor from time to time enabled him to maintain a state of analgesia for several hours, without even carrying the chloroform to the extent of producing insensibility. Equally brilliant results in connection with surgical operations are referred to, and Bernard declares that he knows of no more efficient means of securing immobility in animals during vivisections.

† Rutherford and Vignal—Vol. XI, p. 62, *op. cit.*, p. 277, *supra*: "In two of our earlier experiments we administered chloroform during the preliminary operation, but the stimulation of the liver produced thereby was so remarkable, that the animals were rendered useless for further experimentation," (*i. e.*, for experiments to ascertain the action of other cholagogues.)

‡ In hepatic and nephritic colic I have repeatedly given 30 minims of chloroform at a dose, and sometimes had to give a second dose before the pain was relieved. In the case of a gentleman suffering from nephritic colic, to whom several half-grain doses of morphia had been administered with the effect of producing great cerebral excitement without apparent relief from pain, I saw a single such dose followed by immediate analgesia, and shortly after by a prolonged and refreshing sleep, during which the calculus descended into the bladder. I have usually, however, found much smaller doses sufficient for the relief of the painful cramps of intestinal catarrh. In none of the cases in which I have used chloroform has it appeared to irritate the stomach, but I have never used it in acute dysentery, and can therefore contribute no personal experience to the question of its employment in that disease.

§ Evan Cameron—*Notes of two cases of severe diarrhœa cured by single doses of chloral hydrate*, The Lancet, 1870, Vol. II, p. 602. In both these patients (males) there was vomiting as well as purging, and they appear to have been what we would call in this country cases of cholera morbus. The first received 20, the second 15 grains only. I note that each received as a part of the same dose 15 minims of chloric ether, the chloroform contained in which was no doubt also useful. It is claimed that in both cases the vomiting and purging ceased immediately after taking the dose.

and many additional observations will be required before we can accept the view that chloral acts in dysentery as an antiseptic, destroying that quality of the inflammation by which it extends along the mucous membrane and becomes infectious.

Among the objections to this use of chloral is the probability that it may irritate the stomach. Prince encountered this difficulty so frequently that he advises the physician to have always a second dose ready to administer if the first is rejected. He found, however, that a previous subcutaneous injection of morphia was an efficient aid in rendering the stomach tolerant. Perhaps, however, his mixture of the chloral with Epsom salt, making a bulky and nauseous dose, was greatly to blame for this result, and the trouble would have been less had the medicines been administered separately.* This suspicion is strengthened by the circumstance that Lambert, who gave chloral in dysentery, alternating with other remedies, does not appear to have found it disturb the stomach.†

Liebreich himself has counselled against administering chloral to patients suffering with intestinal ulceration, except very much diluted with mucilaginous fluids;‡ and it is probable that this precaution is necessary; but in weak solutions it has been applied externally to chronic ulcers with apparent benefit, and this circumstance suggested to Newell the use of such solutions as enemata in acute dysentery. The beneficial results he obtained led to a trial of the method by Whitaker, who is said to have found it capable of aborting the disease in a few hours.§ Similar enemata have been employed with benefit by Tyson for the relief of the tenesmus accompanying certain summer fluxes of children.‖ These observations seem to warrant further experiments with chloral hydrate in the treatment of the fluxes, but can hardly be regarded as representing an experience sufficiently extensive to fix satisfactorily the circumstances in which it may be advantageously employed.

A few years since Salvatore Caro (1869) suggested the treatment of summer fluxes, especially in the case of children, with *bromide of potassium*.¶ He was careful to use

* David Prince, of Jacksonville, Ill.—*op. cit.*, p. 748, *supra*. How difficult he found it to give this mixture may be inferred from the following passage: "The administration of salts and chloral should be done by the practitioner, otherwise there can be no assurance that it will all be taken. The unpleasant taste offends the patient, and the bulk seems enormous to friends, and it is likely to be concluded that half the dose is enough, or if the first dose is thrown up, that the medicine does not agree, and the physician is charged with a blunder. The prescription method is not therefore as reliable as the personal dosing by the physician." This paper was read before the Morgan County Medical Society, August 12, 1875.

† S. H. Lambert, of Ogden, Ind.—*Hydrate of chloral in dysentery*, The Clinic, Sept. 11, 1875, p. 126—began his treatment by giving "a good dose" (gtt. iv.) of fluid extract of aconite, which he followed by a dessertspoonful every two hours of a solution of two scruples of hydrate of chloral in two ounces of sweetened water. On the alternate hours he gave powders containing subnitrate of bismuth, tannic acid and ipecacuanha; and on the third day stopped the chloral and substituted a chalk mixture alternatiog with powders of bismuth and pepsin. One case is reported in detail, but the language used implies that it was not the only one: "We are having an epidemic here of the above named disease, and having treated it successfully with hydrate of chloral, is my excuse for reporting the following case."

‡ I cite from a review of the third edition of Liebreich's work—*Das Chloral Hydrat;* [our library has nothing later than the 2d Ed., Berlin, 1869, which does not contain the passage in question,] in the Gazette Médicale de Strasbourg, No. 14, 1871, p. 171. Among the contraindications to the use of chloral laid down by Liebreich, the first is said to be "extensive destructive processes of the mucous membrane of the primæ viæ; in these cases, if the medicine is indicated by other reasons, it ought to be very much diluted with mucilaginous substances, or still better given in enema."

§ W. L. Newell, of Millville, N. J.—*Chloral in dysentery*, Letter dated June 25, 1878, to the Editor, Philadelphia Med. Times, Vol. VIII, 1878, p. 499. For a child aged 11 years he used an injection of 5 grains of chloral hydrate dissolved in two fluidounces of starch gruel. This injection was repeated, "four being given in all." He adds: "The case seemed so satisfactory that I mentioned it to my confrère, Dr. J. S. Whitaker, who has pursued the same treatment with the most happy results in every case, aborting the disease within a few hours. I may mention that he used ten grains instead of five with a lady aged 25, who had twenty or thirty calls in twenty-four hours, with complete repose for eight consecutive hours, with permanent abatement of all other symptoms, without other treatment. The number of aggravated cases of dysentery we have treated with the chloral hyd. warrants us in the assertion that if early and properly used it is *almost* a specific."

‖ J. L. Tyson—*Chloral hydrate and oxide of zinc in acute intestinal diseases of childhood*, same Vol., p. 281—made his enemata by dissolving thirty grains of chloral hydrate in two ounces of starch-water, and injected from a teaspoonful to a teaspoonful and a half once or twice in the twenty-four hours: (this was not a very weak solution, but no harm appears to have resulted from this circumstance.) His object seems to have been merely the relief of the tenesmus, and oxide of zinc was at the same time given internally. Two typographical errors in this article are corrected in the same volume—p. 624.

¶ Salvatore Caro—*The treatment of summer complaints by the bromide of potassium*, The Med. Record, Vol. IV, 1869-70, p. 195: this paper was read before the Medical Society of the County of New York, June 7, 1869; an abstract of the discussion that followed will be found in the New York Med. Jour., Vol. IX, 1869, p. 527—reported 163 cases, most of them children. Of these but three died, "and the fatal result in these was due not to the bowel complaint, but to other causes"—p. 200. I note in this paper the following statement with regard to cholera infantum: "By microscopical examination I have found in the vomited matter only undigested food, in different stages of disintegration, and small particles of the mucous membrane of the stomach. The fæces in the beginning of the affection are like broken-down and half-digested particles of food. When the stools have turned green, they contain decomposed blood and bile; when white, large quantities of mucous membrane, and even matter; and when red, blood"—p. 196. I know not what the author has mistaken for "mucous membrane" in these observations, and I must leave him to reconcile as best he can the presence of blood and pus in the stools, to

moderate doses, admitting that with large ones he did not obtain satisfactory results. Bailey has reported the successful trial of this method in a number of cases, and Williams wrote that he shared the confidence of Caro in the value of this mode of treatment; but it appears that, after a short trial of the bromide by itself, both these physicians were led to use it combined with opiates and other remedies.* Caro himself went so far as to claim specific virtues for his plan of treatment, a claim which has also been made by some of those who have advocated the hydrate of chloral. Into such exaggerations practitioners are only too prone to fall after brief trial of new methods; and these exaggerations, the result of generalization upon insufficient premises, are, as might be expected, not always in the same direction. Thus, only six months before Caro read his paper in New York, Moutard-Martin, communicating his experience with bromide of potassium in the diseases of infants to the Academy of Medicine in Paris, expressed the opinion that the existence of diarrhœa contraindicated its employment.†

It appears much less probable that either of these extreme views is correct than that further observation will indicate some definite field of usefulness for the bromides in the treatment of the fluxes. They may be hoped to prove beneficial particularly in simple diarrhœas due to mere irritation, or mild catarrhal inflammation of the intestinal mucous membrane complicated with nervous excitement or irritability. Such are often the diarrhœas of teething infants, for which I have myself prescribed the bromide of potassium with advantage in a number of instances, and it is not improbable that there are many other varieties of flux in which the action of this drug in diminishing nervous excitement and reflex activity would exercise a favorable influence upon the progress of the complaint; but no evidence has yet been brought forward that warrants the expectation of any curative influence in violent acute inflammations or in the diphtheritic cases.‡

Astringent and drying remedies.—Medicines coming under these heads were freely employed by the Greek physicians in the treatment of the fluxes. Cælius Aurelianus testified that Diocles combined galls with the opium he gave in dysentery, and criticised Erasistratus because he relied solely upon astringents in that disease when so many patients require laxative treatment.§ By the time of Galen a great variety of medicaments possessing, or supposed to possess, astringent or drying virtues had come into use. In his writings the more potent styptic and caustic mineral substances, such as alum, the scales struck off by the smith in hammering copper, burnt copper, sandarach, orpiment and other forms of arsenic,

which he himself testifies, with his speculation that the disease is not inflammatory, but "arises from an over-excitement of the nervous and vascular systems, and that therefore the bromide of potassium affects it, and acts as a sure cure"—p. 200. But notwithstanding this fantastic speculation, and the wild assertion that "the bromide of potassium is an invaluable remedy, nay, a specific in summer-complaints," the author must be credited with having made a suggestion of practical value, by drawing attention to the use of this drug in the fluxes. He usually gave to children 10 to 30 drops, every hour or two, of a mixture containing 10 to 30 grains of the bromide in an ounce of mucilage or orange-flower water.

* F. K. Bailey, of Knoxville, Tenn.—*The Bromides*, The Chicago Med. Examiner, Vol. XI, 1870, p. 19, and *Bromide of potassium*, The Med. and Surg. Reporter, Vol. XXXI, 1874, p. 201. In the latter paper he states that he now generally combines the bromide with "some aromatic and an opiate." F. G. Williams—Chicago Med. Examiner, Vol. XII, 1871, p. 346—writes from Watertown, Wis., April 11, 1871: "After a faithful trial, during two seasons in which there has been a great prevalence of diarrhœa and dysentery, I am almost as confident of the value of the treatment as is Dr. Caro." He adds that he no longer uses it alone, but gives it combined with rhubarb, morphia, &c. To these commendations I may add the testimony of C. G. Polk—*Bromide of potassium and the diseases of dentition*, The Med. and Surg. Reporter, Vol. XXIX, 1873, p. 61.

† E. Moutard-Martin—*Note sur quelques applications nouvelles du bromure de potassium à la médecine des petits enfants*, Bull. Gén. de Thér., T. LXXVII, 1869, p. 391. This paper was read to the Imperial Academy of Medicine, December 1, 1868. The author strongly commends the bromide in the insomnia of infants, and for the relief of certain accidents of dentition and various nervous disturbances, but boldly adds: "On ne doit pas administrer le bromure de potassium aux petits enfants qui ont la diarrhée."

‡ I have not overlooked the advantages claimed to have been obtained by James Begbie—*Note on the use of the bromide of potassium in cholera*, The Lancet, 1866, Vol. II, p. 664—from half-drachm doses of bromide of potassium, given every hour or every half hour, in Asiatic cholera: "Let it be used early in the disease," he writes, "It will arrest the cramps—almost the only pain the patient suffers; it will calm the tossings on the sick-bed as few other remedies can." One of the patients, a woman, took two ounces of the bromide of potassium in twenty-four hours, and recovered. Others treated in the same way died. The evidence brought forward does not satisfy me that the progress of the cases was modified by the treatment.

§ Cælius Aurelianus—*loc. cit.*, p. 735, *supra*. On the following page he adds: "Erasistratus secundo libro de ventre plurima recte componens, solis utitur constrictivis, cum sint plurimi dysenterici laxatione indigentes."

quick-lime and the like, are for the most part directed to be administered in the fluxes only in the form of enemata.* But he lauded whey in which pieces of red-hot iron had been extinguished, for the purpose of giving it astringent virtues, as one of the very best remedies in these disorders.† So, too, he frequently employed by the mouth a variety of prepared earths, named after the countries that furnished them, especially those from Lemnos, Samos and Armenia, which were not merely regarded as possessed of drying powers that might safely be employed in checking the alvine fluxes, since they were free from any acrid properties, but were believed to favor the cicatrization of ulcers, and hence were commended as applications to external sores as well as in the treatment of ulcerative dysentery.‡ He also approved the use of a number of substances, derived from the animal world, which owed their virtues chiefly to their mineral ingredients; among these were the burnt horns of deer and goats, and the burnt shells of oysters, or snails and crabs burnt whole, to all of which he attributed a certain vis exiccatoria.§

Still more numerous were the vegetable astringents employed by Galen in the treatment of the fluxes: among these were the white and Egyptian thorn, the plantain, the flowers of the wild pomegranate, the common bramble, oak-bark and acorns, galls, cistus and hypocistis, green mulberries, the water-lily, Pontic rhubarb, dried roses, the rind of the pomegranate and many others.‖ Some of these he regarded as desiccative or refrigerant, or both, as well as astringent; others he believed to possess special virtues in healing ulcers; some he especially commended for use in dysentery, others in the cœliac affection also, or in the fluxes generally. Mixed with anodynes, aromatics, etc., these mineral or vegetable restraining remedies figure in the majority of the formulæ for internal use in the fluxes

* Some account of the enemata used by the Greek physicians will be given further on.

† GALEN—*loc. cit.*, p. 664, *supra*. In this passage he teaches that if drying properties be bestowed upon whey, it is one of the best remedies for dysentery and all acrid fluxes. For this purpose red-hot flints may be extinguished in it, but even better results are obtained by treating it in the same way by red-hot iron cylinders, "for iron as has been shown possesses also astringent virtues."

‡ For GALEN'S description of these earths and their properties, see especially *De simp. med. temp. ac fac.*, Lib. IX, Cap. 1, [Ed. Kühn, XII, 165 *et seq.*] As to the drying powers assigned to them we read, "desiccandi namque vim terra quævis possidet"—p. 177—with the explanation that since such bodies are by nature dry, and devoid of any mixture of igneous substance, they are almost devoid of irritating properties (minime mordax) especially if washed. Washing till all soluble matters were removed was indeed the general mode of preparation—p. 178. The *Lemnian earth*, of which a favorite variety was known as the Lemnia rubrica or sigillum Lemnium, because the cakes put into the market were marked with the sacred seal of Diana—p. 169—had especially the reputation of healing old and obstinate ulcers if applied to their surface—p. 174. The *Samian earth* was said to be advantageous to dysenteric ulcers if used by the mouth or rectum before they become putrid, and indeed even then sometimes proved beneficial—p. 179. The *Armenian earth*, long afterwards used in medicine under the name of Armenian bole, was useful not merely in dysentery and diarrhœa, but in spitting of blood and in catarrhal affections generally—p. 190. These earths figure in many of the formulæ for internal remedies employed in the treatment of dysentery and other fluxes which have been preserved by GALEN: see, for example, *De comp. med. secundum locos*, Lib. VII, Cap. 4, [Ed. Kühn, XIII, 73 *et seq.*]

§ For the *burnt horns* referred to in the text, see *De simp. med. temp. ac fac.*, Lib. XI, Cap. 1, [Ed. Kühn, XII, 334 *et seq.*] The burnt horns of deer (in modern materia medica calcined hartshorn) are said to cure dysentery and the cœliac affection, "est enim scilicet omnium talium vis exiccatoria." *Burnt oyster shells* are reputed to be useful in chronic fluxes—p. 346. *Snails burnt with their shells* are wonderfully advantageous in dysentery if mixed with galls and white pepper—p. 355—and the *ashes of river crabs* are likewise exiccating, although they have a more remarkable use in the treatment of the bites of mad dogs—p. 356. The *dung of dogs fed on bones*, a substance rich in lime salts, was also a favorite remedy; it was used with milk: see note ‡, p. 664, *supra*.

‖ See *De simp. med. temp. ac fac.*, Lib. VI, [Ed. Kühn, XI, 819 *et seq.*,] for accounts of the *acantha alba* or *spina alba*, white thorn, the root of which is said to be desiccative and moderately astringent, and therefore advantageous to cœliacs; the *acantha Ægyptia*, Egyptian thorn, is said to possess similar properties but in a higher degree; both its seeds and roots were used. The *plantain* or *Arnoglossum* is astringent, desiccative and refrigerant, useful in all fluxes, in rebellious ulcers as well as in putrid conditions, therefore especially in dysentery: all parts of the plants were used—p. 838. *Balaustium*, the flowers of the wild pomegranate, possessed similar properties, and is credited with speedily healing ulcers; this medicine is so useful in dysentery and alvine fluxes that there is no physician who has written on the treatment of these diseases who does not use them—p. 847. All parts of the *rubus* or *bramble* are decidedly astringent, and may be used in dysentery or other profluvia—p. 848. So likewise all parts of the *oak*, but particularly its *bark* and *acorns*, possess astringent qualities, and, especially in decoction, may be used in dysentery and chronic fluxes—p. 866. In the same treatise, Lib. VII, [Ed. Kühn, XII, p. 24 *et seq.*,] *galls* are described as still more astringent, and also to some degree drying and refrigerant. They dry up and restrain fluxes of all kinds. The *cistus* or *rock rose* is astringent in all its parts; its flowers are especially efficacious, if drunk with wine, in dysentery, and cure other fluxes. Moreover, *hypocistis*, the juice of a parasitic plant that grows under the roots of the cistus, (perhaps also the parasite itself,) is still more astringent than cistus flowers, and is a very efficacious remedy in the cœliac affection, dysentery and all fluxes—p. 27. Other drugs of similar properties commended in these disorders are a decoction of the wood of the *lotus-tree*—p. 65; unripe mulberries—p. 78; and in Lib. VIII, same Vol., p. 86, *nymphæa*, the water-lily; *rheum Ponticum*—p. 112; *dried roses*—p. 114; and the *pomegranate*, *malum granatum* or *malum Punicum*—p. 115. These are only a part of the articles of this class enumerated in the treatise cited. The English reader will find pretty satisfactory accounts of all I have named, and many others, in the third volume of Dr. ADAMS'S translation of PAULUS ÆGINETA, cited p. 624, *supra*. These vegetable astringents figure liberally in the formulæ referred to at the close of note ‡, *supra*. I may also draw attention here to a passage in the treatise cited in the present note, Lib. V, Cap. 15, [Ed. Kühn, XI, 756,] in which GALEN singles out galls, the seeds of the acantha Ægyptia and the dried rind of the pomegranate as endowed with the power of inducing ulcers to cicatrize.

which Galen has preserved. With but little change they were employed for the same purpose by all the later Greeks, as well as by the Arabian physicians, as may be seen in the writings of Alexander of Tralles, Ætius, Paulus Ægineta, Rhazes, Haly-Abbas and Avicenna.* According to Harles, some of them even went so far as to administer by the mouth quick-lime, burnt alum, and preparations of copper and arsenic, which their more cautious predecessors had used only in clysters.† Indeed, such prominence was given by the Greek and Arabian writers to the use of astringents and opiates in dysentery that later physicians, who fell into the practical error of resorting to them as the sole remedies in that disease, not unfrequently believed that they were faithfully following the ancient practice.‡

Yet already both Hippocrates and Galen had gone to the extent of exaggeration in their representation of the dangers to be feared from suddenly suppressing the alvine fluxes, and the celebrated methodist Philumenus had strongly advised that astringents should be avoided in the earlier stages of such disorders, although he claimed for them curative virtues when used later in the disease, if the discharges continued after evacuants have been fairly tried. Avicenna, too, insisted that astringents should not be resorted to at the beginning of the fluxes, though he gave them freely enough in the later stages.§

These views, which probably represented the practice of the best physicians of antiquity, were faithfully taught by the leading writers on dysentery of the fifteenth, sixteenth and seventeenth centuries. Savonarola laid it down as a general rule that astringents should not be employed in acute dysentery until after the tenth or twelfth day of the disease; Nicolaus Piso declared that astringents prematurely employed in this disorder prevent the evacuation of the morbid humors, and sometimes augment the fever and inflammation as well as make the ulcers worse; Fabricius Hildanus advised that astringents should not be given until after the fourth or fifth day from the beginning of the disease, when the fever

* ALEXANDER OF TRALLES—Lib. VIII, Cap. 8 and 9, p. 445 *et seq.*, *op. cit.*, p. 624, *supra*. ÆTIUS—Tetrab. III, Serm. 1, Cap. 35, p. 586, *op. cit.*, p. 656, *supra*—preserves the teachings of PHILUMENUS on the treatment of the alvine fluxes: note the astringents for internal use enumerated in the latter part of the chapter; those advised for the cœliac affection by ARCHIGENES will be found in Cap. 37, pp. 591–2. See also, for those commended in dysentery, Cap. 45, pp. 606–7, and the remarkable classification in Cap. 47, p. 609, which contains a list of simples useful in dysentery; under the head of astringents (quæ vero adstringunt) are found many of the vegetable astringents enumerated by GALEN, together with two kinds of earth, the *Lemnia sphragis* (described by GALEN in the chapter on earths, cited in note ‡, last page) and *minium Sinopicum*, probably a red earth from Sinope: see in BAILEY'S Ed. of the *Lexicon* of FACCIOLATI and FORCELLINI, London, 1828, Vol. II, pp. 563 and 566, the words *Sinopicus* and *Sinopis*, where Sinopicum minium is explained to be the terra Pontica or rubrica Pontica of Sinope. See also, in Vol. I, p. 1195, the word *Minium*, which is sometimes interpreted red-lead, sometimes vermilion, sometimes, however, as explained above: "Si quando usum minii legas in medicina, ut apud *Cels.* l. 4. c. 15. *sub fin.* l. 5. c. 19. n. 25. et lib. 6. c. 6. num. 22. terram Lemnium, vel synopicam rubricam interpretantur." The various burnt shells and horns, on the other hand, come under the head of drying remedies, (resiccat.) See also the list of compound remedies to be administered by the mouth in dysentery, Cap. 48, p. 610 *et seq.*, and the treatment advised for lientery in the latter part of Cap. 51, pp. 618–19. PAULUS ÆGINETA—Vol. cited last note, *passim*; also Lib. III, Cap. 40 and 41, Vol. I, p. 520 *et seq.* RHAZES—*loc. cit.*, p. 680, *supra*; also *Ad Mansor de re med.*, Lib. IX, Cap. 72, pp. 257–8. HALY-ABBAS—*Practica*, Cap. 22, fol. 246, Ed. cited p. 678, *supra*; and AVICENNA—*loc. cit.*, p. 704, *supra*. I may add that CELSUS—*loc. cit.*, p. 733, *supra*—was less explicit as to the astringents to be used internally, though he advises that the patient should "take those foods and drinks which have a tendency to bind the bowels." The only astringents he mentions for internal use are cinqueföil and purslain, (portulaca.)

† C. F. HARLES—*De dysenteriæ antiquitatibus*, Opera Minora Academica, T. I, Leipsic, 1815, p. 179: "Et ulceris putatitii a septica mortificatione arcendi et escharæ cicatricisque producendæ causa externa per clysmata applicatione, interdum tamen per os quoque, æque audaci ac inepto nefandeque modo administrarunt calcem vivam, viride æris, alumen ustum, immo ndeu auripigmentum, sandaracham (risigallum), et ipsum arsenicum album (a serioribus tantum Græcis, magisque adhuc ab Arabibus in usum vocatum)." I note that this author speaks on the same page of "minium, jam a CELSO memoratum, et alia saturnina," but we have seen—note *, *supra*—that the minium, which, moreover, CELSUS used only in clysters, was probably not a preparation of lead, but the red earth of Lemnos or Sinope.

‡ Note the pains which ACKERMANN—Lib. II. Cap. 2, p. 131 *et seq.*, *op. cit.*, p. 620, *supra*—takes to refute this error, beginning, "Haud recte autem sibi sapiunt medicinæ professores plurimi, qui solis restringentibus talibusque medicinis, quæ ulcera glutinant, dysenteriæ sanationem a veteribus tentatam esse existimant."

§ HIPPOCRATES—*De victus ratione in morb. acut.*, Append., § 12, [Ed. Littré, II. 469.]—enumerates the evil consequences of suddenly checking a dysentery, in a passage which ADAMS translates—Vol. I, p. 325, *op. cit.*, p. 608, *supra*—"A dysentery, when stopped, will give rise to an apostems, or tumour, if it do not terminate in fevers with sweats, or with thick and white urine, or in a tertian fever, or the pain fix upon a varix, or the testicle, or on the hip-joints." GALEN, in his commentary on this passage—*Comm. IV*, § 71, [Ed. Kühn, XV. 859.]—criticises it because the kind of dysentery is not stated, and remarks that every dysentery does not, when checked, produce these evil effects; but he himself is not more specific as to the kind of dysentery to the sudden checking of which he ascribes the evil effects enumerated in note †, p. 411, *supra*; indeed he does not limit them to dysentery, but declares that he has known them to result also from hæmorrhoids or other similar discharges (evacuationes hujusmodi) suddenly suppressed by ignorant physicians. PHILUMENUS held similar views—*loc. cit.*, note *, p. 735, *supra*. He taught that at the beginning of alvine fluxes we should assist nature in her efforts to get rid of superfluous or noxious matters, and only resort to astringents by the mouth after evacuants have been sufficiently tried and fail to cure, then, indeed, astringents are useful: "In potu vero accepta ventris fluxus post sufficientem inutilium evacuationem sanant"—*loc. cit.* AVICENNA—*loc. cit.*, p. 704, *supra*—wrote: "Et non est conveniens ut in primis incipiat medicinis puris (singularibus) cum qualitatibus suis stypticis et asperis."

and griping pains have subsided under the use of evacuants; and similar cautions are expressed in the writings of Hollerius, Sennertus, Sydenham and Ettmüller.* The experience of subsequent physicians led them very generally to the adoption of these views. It would be easy, but it is hardly necessary, to multiply examples. Let it suffice to refer, in illustration, to the utterances of Hoffmann, Degner, van Swieten, Pringle, Tissot, Zimmermann and Cullen in the last century,† and to Fournier and Vaidy, Broussais, Naumann, Copland, Savignac, Barrallier and Heubner in this.‡

It is true that from the earliest times there have been physicians so rash, or, to use the language of Galen, so ignorant, as to undertake to suppress the discharges at the very beginning of the flux. Degner testified that this was the common practice of the medicasters who abounded at Nimeguen during the epidemic he described; while Tissot affirmed that it was exceedingly common in his day, annually killed a great number of persons, and threw others into incurable disorders.§ It is to be feared that this error is too often

* Savonarola—fol. 178, *op. cit.*, p. 736, *supra:* "Secundo scito quod cum transierunt dies decem vel duodecim præsumendum est quod evacuatio facta sit perfecta, et post talem evacuationem poteris uti stipticis." Nicolaus Piso—p. 276, *op. cit.*, p. 665, *supra:* "Alioqui astringentia febrem augeat et inflammationem, vitiosam materiam cohibent, ne foras effluat, eaque cohibita regurgitat sursum, unde gravior febris, convulsiones, et hujusmodi. Adde quod astringentia, ulcera exasperant. Itaque astringentium usus tempestivus est jam vacuata magna ex parte materia, vel ex toto: quumque tempore excernitur cum vitioso humore frugi succus, et inde virium casus metuitur." He suggests that when they are first given, diuretics should be added, that any evil humors remaining may escape by the kidneys and not be thrown back upon the nobler organs. Fab. Hildanus—Cap. 10, p. 685, *op. cit.*, p. 644, *supra.* Hollerius—Lib. I, Cap. 40, fol. 120, *op. cit.*, p. 680, *supra.* Sennertus—T. III, p. 176, *op. cit.*, p. 645, *supra.* Sydenham—Sect. IV, Cap. 3, Vol. I, p. 167, *op. cit.*, p. 407, *supra:* "Aphthæ, too, towards the close of the disease, beset the inner parts of the mouth and the fauces, particularly when the body has been long overheated, and when the evacuation of the peccant matter has been checked by astringent remedies, administered before the application of catharties. These are generally signs of imminent dissolution." Ettmüller—*De morb. human. corp.*, Cap. IX, p. 127, *op. cit.*, p. 647, *supra*—went so far as to declare, "certe nihil pejus est quam uti in dysenteria adstringentibus," but it is clear from his subsequent remarks that he only meant this to apply to their premature employment.

† Hoffmann—*loc. cit.*, p. 739, *supra*—not only avoided astringents early in this disease, but objected to the use of the more potent articles of this class at any time during its progress. Degner—Cap. 5, § 11, p. 268, *op. cit.*, p. 625, *supra*—wrote: "Adstringentibus raro opus erat; excretio enim alvi sua sponte cessabat, postquam venenum aut subactum, aut exactum fuit. In sinu autem concludunt anguem, qui adstringentibus pugnant." Nevertheless, after the use of evacuants, if the flux continued, he sometimes employed catechu and other mild astringents. Van Swieten—§ 722, T. II, p. 392, *op. cit.*, p. 663, *supra*—after praising the use of corroborants and mild astringents in the latter stages of the fluxes, adds: "Verum antequam hæc adhibeantur, certi debemus esse, materiam irritantem expulsam esse, et solam ventriculi et intestinorum flaccidam debilitatem peccare. Si enim adstringentibus alvi fluor sistatur, antequam noxii humores expulsi fuerint, gravissima sæpe mala sequuntur." Pringle—Part III, Chap. 6, Sect. 4, p. 275, 1st Ed., cited p. 693, *supra*—wrote: "The hæmorrhage seems to require repeated bleedings and styptics; the flux, strong astringents; and the pains of the bowels, constant opiates: and yet unless these remedies are used with extreme caution, they tend more to augment than cure the disease." This passage is repeated in the subsequent editions. He only used astringents in the third stage of the disease, and then mild ones, such as extract of Campeachy wood, but these he often saw fail, for he writes "when no astringents have availed, I have frequently known the cure obtained by a milk- and farinaceous diet, without them"—p. 283, 7th Ed., cited p. 640, *supra.* Tissot—*loc. cit.*, p. 740, *supra*—was as severe on the use of astringents as of opiates: "En empêchant l'evacuation de ces matieres, en renfermant le loup dans la bergerie, il arrive, ou 1° que cette matiere irrite les intestins, les enflamme, et de l'inflammation naissent les douleurs horribles, la vraie colique inflammatoire, et ensuite, ou la gangrene et la mort, ou un squirrhe qui dégenere en cancer (j'ai vu ce cas horrible), ou la suppuration, un abcès, un ulcere; ou 2° qu'elle se rejette ailleurs, produit des squirrhes au foye, des asthmes, l'apoplexie, l'épilepsie ou mal caduc, des douleurs de rhumatisme horribles, des maux de yeux, et des maux de peau incurables." Zimmermann—Cap. VII, S. 134, *op. cit.*, p. 648, *supra*—devoted a whole chapter of his work to pointing out the evil effects of astringent and constipating remedies, as well as of aromatics and alcoholic drinks: rheumatic pains and dropsies are the commonest of these. Nowhere is his practical skill better illustrated than by the examples adduced to enforce these precepts; but he shows little acquaintance with the ancients when he accuses them of avoiding evacuants and relying wholly upon restraining remedies: "Die ältern Aerzte kamen darinn in der Heilung der Ruhr so ziemlich überein, dass sie nicht die Materie zum Auswurf zu bringen, sondern sie vielmehr zurückzuhalten, und den Ausfluss durch verdikernde und zusammenziehende Mittel zu hemmen suchten. Auf diese Aozeigen bezog sich ihre Diät, und ihre ganze Heilungsmethode." Cullen—*First Lines*, § 1086, Vol. II, p. 327, Ed. cited p. 648, *supra*—wrote: "From the account now given of the nature of this disease, [dysentery,] it will be sufficiently obvious that the use of astringents in the beginning of it must be absolutely pernicious." In the remarks added to this paragraph, from his manuscript lectures, by the Editor, he expresses the opinion, however, that astringents may be useful in diarrhœa which merely "consists in an increased evacuation from the exhalents and excretories on the internal surface of the intestines."

‡ Fournier et Vaidy—p. 384, *op. cit.*, p. 362, *supra*—express the opinion that catechu, logwood, tormentil, bistort and other astringents are even more injurious than aromatics in acute dysentery: "La neix de galle, beaucoup plus astringente que toutes ces substances, serait encore plus dangereuse." Broussais—T. III, p. 226, *op. cit.*, p. 643, *supra*—remarked: "Les astringens augmentent souvent la phlogose en arrêtant la diarrhée. Ils ne manquent point d'opérer ainsi, chaque fois qu'on les donne à dose suffisante pour qu'ils parviennent dans le colon." Naumann—Ed. IV, Abth. 2, S. 89, *op. cit.*, p. 615, *supra*—after observing that there is scarcely a single tonic or astringent drug that has not been recommended in dysentery, adds: "Sie können aber, zur unrechten Zeit angewendet, das grösste Unheil anrichten." Copland—Vol. I, p. 730, *op. cit.*, p. 683, *supra*—says: "It should be recollected, when prescribing astringents in this disease, that they are injurious when exhibited early in the acute states, and whilst there is much fever, or when morbid matters remain to be evacuated." Savignac—p. 399, *op. cit.*, p. 620, *supra*—wrote: "S'il est irrationnel de chercher à jnguler dès son début la dysentérie par l'opium, il l'est encore plus de l'attaquer par les astringents;" and again, "les astringents sont inopportuns et nuisibles au début de la dysentérie." Barrallier—p. 770, *op. cit.*, p. 603, *supra*—observes: "Nous devons dire d'une manière générale que les astringents, nuisibles au début de la dysentérie aiguë, peuvent être utiles seulement dans le cours de la dysentérie chronique;" and Heubner—S. 544, *op. cit.*, p. 529, *supra*—expresses the opinion that the experience of several centuries, both in the epidemic dysentery of tropical regions and the epidemics of temperate zones, teaches, "dass die Ruhr nicht unter einer stopfenden Behandlung, sondern unter der Anwendung ausleerender Methoden am günstigsten verläuft und am raschesten heilt."

§ Galen speaks in the passage referred to in note †, p. 411, *supra*, of the discharges being suppressed in consequence of the ignorance of the physicians, ἰατρῶν ἀμαθείᾳ. Degner—Cap. 3, § 87, p. 211 *et seq.*, *op. cit.*, p. 625, *supra*—referring to this matter, wrote: "Vanos sane, fallaces, imo funestos ut plurimum ejusmodi fuisse conatus, facile conjicere potest, qui cognoscit, omnium ejusmodi vitio creatorum Medicastrorum unicum scopum eo collimasse, ut alvi fluxum tantummodo supprimerent et adstringerent, parum soliciti, num materies peccans evacuata, aut satis correcta sit, nec ne." Tissot—see *loc. cit.*, note ‖, p. 739, *supra*.

imitated in modern times; but those who fall into it do so in despite of the accumulated testimony of the best observers of all ages. Yet the great majority, even of those who have most earnestly cautioned against the rash use of astringent remedies in the early stages of dysentery, have nevertheless employed them with more or less freedom in the advanced stages of the disease and in the chronic fluxes; and the ancient belief that it is possible in this way not merely to restrain excessive discharges, but to favor the healing of intestinal ulcers, when these exist, still survives in modern times.

Concerning the choice to be made among the medicaments under consideration, divers opinions have existed, and from time to time various drugs have held the prominent place in the esteem of practitioners. After the revival of learning in Europe, the Galenists brought into vogue a large number of the remedies employed by their master; and the vegetable astringents, the earths and cretaceous preparations of animal origin figured largely in their treatment of the later stages of dysentery, while, on the other hand, the iatrochemists introduced some of the more potent mineral salts.

*Vegetable astringents.*—Some of the substances of this kind commended by Galen, especially *galls*, the most important of all, have remained in use to the present day; others sooner or later became obsolete, while new substances came into prominence from time to time. It is not necessary to enter here into tedious details with regard to these, but a few of those most generally used may be briefly alluded to. Among them were *tormentil* and *bistort*, whose virtues in restraining the fluxes are mentioned by some of the herbalists of the sixteenth century, which figured as ingredients in the diascordium of Fracastorius, and occupied a prominent place among the astringents employed in dysentery by Hildanus, Sennertus and many later physicians.* Here, too, belongs *catechu*, known at first as terra japonica and supposed to be an earth, which Garcia de Orta lauded as an astringent in the alvine fluxes as early as 1563; G. W. Wedel commended it in dysentery in 1671, and Degner regarded it as the safest and at the same time the most efficacious astringent that can be employed either in that disease or in diarrhœa.† *Kino*, a very similar though less

* *Tormentil*, (German *Ruhrwurzel*, see C. G. MITSCHERLICH—*Lehrbuch der Arzneimittellehre*, 2te Aufl., Bd. I, Berlin, 1847, S. 269,) the rhizome of *potentilla tormentilla*, the *t. erecta* of LINNÆUS, see PEREIRA—Vol. II, p. 794, *op. cit.*, p. 746, *supra*—still figured in the secondary list of the Materia Medica in the United States Pharmacopœia of 1870, which, however, is not the case with *bistort*, the root of *polygonum bistorta*, see PEREIRA—Vol. cited, p. 437. I will not attempt to fix the date of the introduction of these plants into medicine, or enter into the doubtful question of their identity with plants known to the ancients under other names. It has been conjectured by SPRENGEL—*Hist. Rei Herbariæ*, Paris, 1808, T. I. pp. 43, 93 and 176—that tormentil is the plant known to HIPPOCRATES, THEOPHRASTUS and DIOSCORIDES under the name πεντάφυλλον. Bistort was probably introduced at a much later date. But whatever their early history, we find both highly reputed in the treatment of dysentery in the sixteenth and seventeenth centuries. For the *diascordium* of FRACASTORIUS, referred to in the text, see note §, p. 737, *supra*. JOHN GERARDE—*Herball*, London, 1597, Booke II, Chap. 84, p. 323—says of bistort: "The roote boiled in wine and drunke, stoppeth the laske, and bloodie flixe;" and of tormentil—Chap. 367, p. 840—that the powder of its root "cureth the laske and bloudie flixe, yea although the patient haue adioined vntu his scouring a greenous feuer." For the use of these and other astringents by HILDANUS and SENNERTUS, see the places in their writings referred to in note *, p. 764, *supra*.

† *Catechu* is an extract prepared from the acacia catechu and other trees. D. BARBOSA—*A Description of the Coasts of East Africa and Malabar in the beginning of the sixteenth century, by Duarte Barbosa, a Portuguese;* translated from an early Spanish manuscript in the Barcelona library, with notes and a preface, by the Hon. HENRY E. J. STANLEY, London, printed for the Hakluyt Society, 1866, p. 191—mentions "a drug which we do not possess," called *cachô* among the exports from Cambay to Malacca, but says nothing of its properties. FLÜCKIGER and HANBURY—*Pharmacographia*, p. 213, Ed. cited p. 703, *supra*—quote this statement with the remark: "This is the name for Catechu in some of the languages of Southern India." The medicinal virtues of this drug were first described by GARCIA DE ORTA—*Collaquios dos Simples e Drogas*, &c., Goa, 1563; I have not seen the original, which is very rare, but cite from a modern reprint, Lisbon, 1872, p. 125 *et seq.*—who described it under the name of *cate*, and claimed that it was useful in checking fluxions of the eyes, strengthening the gums and teeth, "and that it was useful to the throat, in cases of lumbricoids, and in looseness of the bowels," (e aproveita pera a garganta e pera as lombrigas e pera as camaras.) C. CLUSIUS (DE L'ÉCLUSE) published an epitome of GARCIA'S work—*Aromatum, et Simplicium aliquot Medicamentorum apud Indos nascentium Historia*, Antwerp, 1574, Lib. I Cap. 10, p. 46—from which I extract the following description of its virtues: "Optimum est medicamentum non modo ad confirmandas gingivas, et desiccandum et constringendum; verum etiam ad alvi profluvia curanda, oculorumque dolores tollendos, in quibus plerumque optimo cum successu usus sum." I note that STILLÉ—Vol. I. p. 231, *op. cit.*, p. 711, *supra*—writes: "Its medicinal qualities were first described, in 1601, by Garzia del Huerto," &c., but as he cites no authority, I know not how he fell into this error of date. GARCIA regarded catechu as identical with the *lycium* of DIOSCORIDES—Lib. I, Cap. 133, fol. 52, Ed. cited p. 623, *supra*—but this view has been disputed by J. F. ROYLE—*On the lycium of Dioscorides*. Transactions of the Linnean Society of London, Vol. XVII, 1837, p. 83—and must be regarded as a mere conjecture. GARCIA knew very well that catechu was the juice of a tree, which he correctly described as well as the manner of preparing it, but notwithstanding the publicity given to his writings by CLUSIUS, whose Epitome ran through five editions, (the 5th printed at Leyden in 1605,) when the drug first found its way to Europe it was supposed to be an earth, and was called terra Japonica. J. SCHRŒDER—*Pharmacopœia Medico-Chymica*, 4th Ed., Lyons, 1654, which I have not seen, and cite from the *Pharmacographia*, p. 214—described it under this title as "genus

energetic astringent, was first brought into general notice in connection with the treatment of the fluxes in 1757 by Fothergill, to whom Oldfield had communicated his observations of its usefulness in chronic diarrhœas.* *Logwood* came into use a little earlier; its extract was already prescribed in the advanced stages of dysentery by Pringle in 1751.† The astringent virtues of *rhatany* were made known in 1796 by Ruiz, who commended it in the treatment of fluxes of blood of all kinds, and in 1806 by Reece, who lauded it in several disorders, among others in chronic dysentery and lientery.‡

Various other vegetable astringents have been employed, but it is unnecessary to enumerate them here.§ All are believed to owe their virtues to the presence of principles belonging to the tannin group. Between these, slight chemical differences have been generally admitted to exist,‖ but there is no satisfactory evidence of any material differences in their chemical nature, and it has even been claimed that all they are capable of doing in the alvine fluxes may be effected by the officinal tannic acid.¶ Accordingly *tannin*, the

terræ exoticæ." G. W. WEDEL—*Usus novus catechu, seu terræ Japonicæ*, Misc. Cur. German., Dec. I, an. 2, 1671, Obs. 128, p. 209—mentions that when he wrote it was regarded as an earth by some, by others as an expressed juice, while others believed it to be a compound. He added a short paper—*Tinctura catechu styptica*, Obs. 130, same Vol., p. 211—in which he praises the virtues of the tincture in the fluxes, including dysentery, "in ipsa dysenteria." L. SCHRŒCK—*De catechu*, same Jour., Dec. I, an. 8, 1677, Obs. 54, p. 88—argued in favor of its vegetable nature, which was established by the subsequent observations of J. O. HELBIG—*De rebus variis Indicis*, same Jour., Dec. I, an. 9 et 10, 1678–9, Obs. 194, § 26, *Caatchu*, p. 463; A. CLEYER—*De catechu*, same Jour., Dec. II, an. 4, 1685, Obs. 3, p. 6; and others. See, besides the above citations, PEREIRA—Vol. II, p. 832, *op. cit.*, p. 746, *supra*. DEGNER—Cap. 5, § 12, p. 269, *op. cit.*, p. 625, *supra*—declared that when, after the removal of the cause of the flux, (by evacuants,) it still continued, simaruba or cascarilla bark and the succus catechu can supply the place of all other tonics and astringents. In a foot note he chiefly praises the last two, remarking, "in diarrhœis, dysenteriis, similibusque alvinis fluxibus, efficacissima sane et tutissima sunt remedia."

* *Kino* is the inspissated juice of the *pterocarpus marsupium* and other plants: see PEREIRA—T. II, p. 824, *op. cit.*, last note; STILLÉ—T. I, p. 237, *op. cit.*, last note; and the *Pharmacographia*, p. 170. Attention was first attracted to its medicinal virtues by FOTHERGILL—*A letter from Dr. John Fothergill, to the Medical Society, concerning an astringent gum brought from Africa*, Med. Obs. and Inquiries, Vol. I, London, 1757, p. 358—who suggested its use in the fluxes in consequence of the good effects obtained with it by OLDFIELD in a case of "obstinate chronical diarrhœa." See also C. A. SCHENCK—*Diss. inaug. chemico-med., sistens gummi-kino usum ejusque virtutes*, Marburg, 1784—who brings forward the testimony of SCHAEFER and EBELIN, as well as FOTHERGILL, as to its virtues in inveterate diarrhœas—p. 30.

† *Logwood*, the heart wood of the *hæmatoxylon Campechianum*, was first introduced into Europe as a dyestuff, and was not employed in medicine until shortly before 1746, when it was introduced into the London Pharmacopœia under the name of lignum tinctile Campechense: see the *Pharmacographia*, p. 186, and PEREIRA—Vol. II, p. 837, *op. cit.*, last note. An extract of this wood was already in use in 1751, and its use in dysentery was recommended by PRINGLE in the first edition of his work—p. 285, Ed. cited p. 693, *supra*. His prescription was: "℞. Extract. Lign. Campech. 5iij. Solv. in Aq. Cinnamom. spir. 5j. add. Aq. fontan. 5vij. Tinct. Japonic. 5ij. M." The dose was "two spoonfuls once in four or five hours." The same formula figures in his account of the treatment of the third stage of the disease in the 7th edition, p. 281.

‡ *Rhatany* is the root of the *krameria triandra:* see PEREIRA—T. II, p. 995, *op. cit., supra;* STILLÉ—T. I, p. 238, *op. cit., supra;* and the *Pharmacographia*, p. 74. Its virtues as an astringent were first pointed out by HIPOLITO RUIZ in a dissertation published in the first volume of the *Memoirs of the Royal Academy of Medicine of Madrid*, 1797, which I have not seen, but cite the French translation of BOURDOIS—*Diss. sur la racine de la ratanhia. Traduite de l'espagnol, en l'an* 1806, *par ordre du Ministre des Relations Extérieures.* He recommended it in excessive menstruation and in fluxes of blood of all kinds, as well as to arrest hæmorrhage from recent wounds by its local action and as a mouthwash—p. 16. RICHARD REECE published an article on the medicinal virtues of this root and its extract in the London Medical and Chirurgical Review, Vol. XIII, 1806—I cite from the *Pharmacographia*, the volume being missing from the file of this journal in the Library of the Surgeon General's Office—and in a separate pamphlet—*Pract. obs. on the radix rhataniæ, or, rhatany root, a production of Peru*, London, 1808. It seems that shortly before, the cargo of a Spanish prize was sold in the London drug market, and it thus fell into his hands. He recognized its astringent virtues, which he employed in various diseases, and gives a formula for its use in chronic dysentery, lientery, &c. See also the dissertation of E. L. A. V. ECKARD—*De radice ratanhiæ*, Berlin, 1822—who praises it highly in diarrhœa and rheumatic dysentery—p. 24.

§ The list would embrace not only all the officinal vegetable astringents but many others. I have made no attempt to collect the scattered commendations of these substances. The following papers, which I find mentioned in my notes, are only referred to here as illustrations of their character: JAMES WOODHOUSE—*An inaug. diss. on the chemical and medical properties of the persimmon tree*, Philadelphia, 1792; D. M. P. REISS—*Note sur l'emploi de l'extrait d' ai relle myrtille dans la diarrhée*, [vaccinium myrtillus, Linn.,] Jour. de Méd., T. I, 1843, p. 115; J. C. C. BLACKBURN—*The strawberry leaf, a valuable auxiliary in the treatment of chronic dysentery*, Southern Med. and Surg. Jour., Vol. III, 1847, p. 657; C. HANDFIELD JONES—*Note on the use of Ashantee bark in chronic dysentery*, The Brit. Med. Jour., Vol. I for 1871, p. 588; LEVRAT-PERROTON—*Obs. sur l'emploi de la renouée* [polygonum aviculare] *dans la diarrhée*, Revue Méd. Française et Étrangère, T. III, 1845, p. 421; J. C. WHITEHILL—*On the treatment of chronic diarrhœa and dysentery, with a decoction of the inner bark of the pine tree*, Med. Archives, St. Louis, Vol. VI, 1871, p. 327; A. D. BINKERD—*Therapeutic value of the fresh pecan* [nuts] *in subacute diarrhœa*, The Med. and Surg. Reporter, Vol. XXXII, 1875, p. 58; S. C. PARSONS—*Cota bark in the diarrhœa of children*, The Med. Record, (N. Y.,) Vol. XIV, 1878, p. 288.

‖ According to A. and T. HUSEMANN—*Die Pflanzenstoffe*, Berlin, 1871, S. 996—the tannic acid of galls was discovered by DEYEUX in 1793 and SEGUIN in 1795. With regard to the chemistry of the bodies of this group, consult L. GMELIN—*Hand-Book of Chemistry*. Translated by Henry Watts, London, printed for the Cavendish Society, Vol. XV, 1862, p. 449 *et seq.* The HUSEMANNS suggest—*op. cit.*, S. 526—that further investigation may perhaps show the actual identity of many of these bodies: and if the new views with regard to the nature of tannic acid (see note ‖, p. 768, *infra*) are correct, this is probable enough. Both their work and that of GMELIN contain good references to the bibliography of the subject up to date of publication.

¶ As to the physiological and therapeutical effects of tannic acid, see J. CLARUS—*Handb. der Spec. Arzneimittellehre*, 3te Aufl., Leipsic, 1860, S. 454; STILLÉ—Vol. I, p. 220 *et seq., op. cit., supra;* NOTHNAGEL—S. 315 *et seq., op. cit.*, p. 746, *supra;* H. C. WOOD—p. 26 *et seq., op. cit.*, p. 675, *supra;* and BUCHHEIM—S. 418 *et seq., op. cit.*, p. 746, *supra*. CLARUS classes the various vegetable astringents under the head of "medicamenta tannica," NOTHNAGEL as "tanninhaltige Mittel," BUCHHEIM, as "Gruppe der Gerbsäuren." NOTHNAGEL remarks: "Die Gerbstoffe in den verschiedenen Pflanzen differiren etwas in ihrem chemischen Verhalten, doch haben wir bis jetzt keine Anhaltepuncte dafür, dass dies auch einen merklichen Unterschied in physiologischer oder therapeutischer Beziehung bedingte." With this I heartily agree; I have been unable to find satisfactory evidence of any difference in therapeutical action even between the tannins which strike a blue-black (gallo-tannic acid) and those which strike a green-black (kino-tannic acid) color with the persalts of iron.

so-called tannic acid, generally believed to represent substantially the active principle of the astringent simples, has to a considerable extent replaced them of late years in the treatment of the fluxes. Not only is it conveniently administered in pill form, and readily given in definite doses, but it was hoped that it would afford the means of restraining excessive discharges from the bowels more energetically than can be done by the astringent simples, unless they are given in inconvenient bulk. Tannin has hence been recommended in the advanced stages of dysentery, and in chronic fluxes, by Bertini, Waidele, Clarus and others.* During our civil war it was frequently employed in these conditions, generally in connection with opium, and Stillé has expressed the opinion that no remedy proved comparable to this combination in efficacy.†

But the general tenor of recent clinical experience is by no means in accord with this favorable view, and probably the majority of practitioners will agree with Niemeyer, that if acetate of lead or some other favorite mineral astringent fails, no great good is to be expected from tannin or any of the vegetable substances that contain it.‡ And in fact the little that is known concerning the physiological action of tannin seems to indicate that its range of usefulness in the fluxes must be comparatively limited. Although its astringent influence upon the mouth and fauces and upon external wounds or ulcers is decided, its operation in the stomach is of a much less powerful character, for a part of it is speedily precipitated with the mucus and albuminous compounds of the gastric contents in the form of insoluble and probably quite inert tannates, while the rest is rapidly converted into gallic acid.§ Indeed, it may well be questioned whether, when tannin is administered by the mouth, any of it reaches the intestinal canal unless it be given in considerable doses, or perhaps in the form of pills, some undissolved portion of which may be hoped to pass the pylorus unchanged.‖

These considerations warrant the expectation that the astringent effect of tannin upon the bowels would prove much less energetic than might be anticipated from its behavior when used as an external application; and this expectation is corroborated by the phenomena observed after notable quantities of the drug are swallowed by healthy individuals. Mitscherlich reported that the temporary constipation, frequently produced by the administration of ten to twenty grains three times daily, generally ceased spontaneously after two

* B. Bertini—*Quelques observations pratiques sur l'utilité du tannin dans les diarrhées invétérées et rebelles aux moyens ordinaires*, (translated from the Giornale delle scienze mediche, pubblicato della Accademia reale di Torino, nº de Mars 1846,) Gaz. Médicale de Montpellier, April, 1846, p. 12—gave 10 to 20 grains of tannic acid twice daily in obstinate diarrhœas. Waidele—*Ueber die Behandlung der Ruhr*, Memorabilien aus der Praxis, Jahrg. I, 1856, No. 23—used it both internally and as an enema in acute dysentery when the alvine discharges continued after the tormina ceased. Clarus—S. 463, *op. cit.*, note ¶, last page—states that he has frequently employed it, and found it most useful in the chronic intestinal catarrhs of children and in chronic dysentery.

† See Section II of this chapter, where tannic acid is commended as a remedy in chronic diarrhœa by Schüssler—p. 44, *supra;* B. Woodward—p. 51, (who, however, preferred gallic acid when he could get it;) Blakeslee—p. 76; Bretz and Scheetz—p. 80; Grimes—p. 86; Walton—p. 88; and Cooper—p. 93. On the other hand, Brown—p. 81—declared that he had made a thorough trial of it without good results. Other vegetable astringents, such as kino, catechu, oak-bark, or, indefinitely, "vegetable astringents," are commended by Storrow—p. 43; Wood—p. 74; Hoyt and Scheetz—p. 80. On the other hand, Penrose—p. 45—reported that they "palliate rather than cure;" and Bigelow—p. 83—that he had tried them without avail. Stillé—Vol. I, p. 223, *op. cit.*, p. 711, *supra*—thinks tannic acid more useful in the chronic fluxes "than any other medicine of its class, even more so, perhaps, than the acetate of lead." He adds: "During the late civil war we found, during an extensive and prolonged hospital practice, no remedy for chronic diarrhœa and dysentery at all comparable to tannic acid associated with opium and a strictly regulated milk diet." But how much of the apparent success, which this physician observed at Satterlee hospital, was due to the drug? how much to the milk diet and change of climate?

‡ Niemeyer—Bd. II, S. 756, *op. cit.*, p. 645, *supra:* "Lässt auch diese Behandlung im Stich, so ist von der innerlichen Darreichung des Argentum nitricum und den vegetabilischen Adstringentien, namentlich dem Tannin, noch weniger zu erwarten."

§ See, on this subject, the testimony of Clarus, Stillé, Nothnagel, H. C. Wood and Buchheim, cited note ¶, last page. The insoluble tannates thus formed are discharged by stool, while the gallic acid is absorbed and eliminated by the urine.

‖ Clarus expresses the opinion that if tannic acid is given in sufficient doses, it may reach the intestine unchanged and exercise its characteristic effects by diminishing secretion, precipitating mucus and albuminates, and acting as an astringent. In consequence of this latter effect, he thinks it may even act as a vermifuge, the entozoa and their eggs being mechanically entangled in the precipitate, and so readily driven along by the peristaltic movements. We are, however, entirely without experimental evidence as to the quantity of tannic acid that must be given before any of it can reach the intestine unchanged. H. C. Wood—*loc. cit.*—remarks: "When the bowel is to be influenced, as in diarrhœa, the drug should be administered in pill (three to five grains), so that, if possible, it may pass the pylorus undissolved."

or three days without the necessity of employing laxatives.* Still more noteworthy were the observations Tully made on himself, and which were repeated by several of his students; ten grains taken four times daily for about a week exercised no more constipating effect than if they had eaten "so much maize meal."† Nor is it advisable to endeavor to obtain greater effects from the drug by more considerable doses. Even in healthy individuals these produce loss of appetite, gastric uneasiness, vomiting, sometimes even diarrhœa,‡ and in patients whose digestion is already disordered they are not to be thought of.

Accordingly it is not surprising that some physicians should agree with Savignac in claiming that catechu, rhatany and other simples possess a special efficacy of their own, and produce better results in the fluxes than can be obtained from pure tannin,§ although it would seem that this view represents the survival of ancient prejudice quite as much as logical deduction from observed facts. Indeed, in view of the great probability that any astringent operation exerted in the intestine after the ingestion of tannin is due to the gallic acid into which it is transformed, it would seem more rational to resort to this acid as a substitute; and if it be true, as recent chemical researches seem to show, that tannin is merely an anhydride of gallic acid,‖ we may thus hope to imitate better the effects of the astringent simples, and at the same time retain the advantages of using a substance which may be given in definite dose, free from the admixture of foreign, inert or objectionable matters.

This choice has already been made, though on other grounds, by Bayes, Young and other physicians,¶ who have commended *gallic acid* in diarrhœa and dysentery. It is well worthy of further trial. Although less energetic than tannin when externally applied, it is probable that a greater astringent effect can be produced in the intestine by its use; moreover, it is readily absorbed into the circulation,** and appears to owe a part of its

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* MITSCHERLICH—Bd. I, S, 249, *op. cit.*, p. 765, *supra*—on the strength of these observations, criticises CAVARRA—*Du tannin*, &c., Bull. Gén. de Thér., T. XII, 1837, p. 165—who states that having taken himself 2½ grains three times daily for three days, an obstinate constipation resulted which lasted eight days, and only yielded to two drops of croton oil. "Diese Beobachtung," writes MITSCHERLICH, "wird gewiss selten bestätigt."

† WILLIAM TULLY—*Materia Medica*, Vol. I, Part 2, Springfield, (Mass.,) 1858, p. 1112. He adds: "Subsequently a similar trial of this agent was made by several of my professional pupils, and with no more effect as respects the intestinal discharges, than upon myself;" and declares further: "I was never so fortunate as to arrest a case of diarrhœa with this article, since I first had knowledge of it, though I have administered it in small doses and large, at short intervals and long, and have employed it both perseveringly and transiently, and in a considerable number of cases."

‡ MITSCHERLICH—*loc. cit.*, *supra*—writes: "Zu grosse Gaben dagegen machen Magendrücken, Übelkeit, Erbrechen, seltener Diarrhöe, die Zunge wird belegt und der Appetit geht verloren." TULLY—*loc. cit.*—says of the doses taken by himself and his students: "The article nauseated a little however, and impaired the appetite considerably." NOTHNAGEL—*loc. cit.*, note ¶, p. 766, *supra*—testifies: "Auf sehr grosse Gaben entsteht Würgen, Erbrechen, Durchfall und weiterhin der andere Symptomencomplex einer acuten Gastro-Enteritis;" and BUCHHEIM—S. 420, *op. cit.*, p. 746, *supra*: "Nach grösseren Dosen (1–2 Grm.) tritt ein unangenehmes Gefühl in der Magengegend, Aufstossen und Uebelkeit und auch wohl Erbrechen ein."

§ SAVIGNAC—p. 400, *op. cit.*, p. 620, *supra*: "Mais, soit que d'autres principes exercent aussi une certaine action, soit que les tannins modifiés qui se trouvent dans le cachou, le ratanhia, le kino, etc., aient une efficacité spéciale, il est positif que ces substances et leurs analogues produisent de meilleurs effets que le tannin pur." Further on he expresses a decided preference for catechu and rhatany. I may add that SAVIGNAC altogether rejects mineral astringents in the treatment of dysentery, with the single exception of perchloride of iron.

‖ A. and T. HUSEMANN—S. 1001, *op. cit.*, p. 766, *supra*—have sketched the earlier studies in this direction: LIEBIG had shown that by boiling with dilute sulphuric acid, tannin is converted into gallic acid. At the same time, according to STRECKER, glucose is formed; and it was supposed that the tannin broke up into gallic acid and glucose. But the observations of STENHOUSE, and of ROCHLEDER and KAWALIER, demonstrated that the quantity of glucose thus obtained is less and less in proportion as the tannin is purer, and that when the sulphuric acid is sufficiently dilute, almost the whole mass of tannin is transformed into gallic acid. H. HLASIWETZ—*Ueber die Beziehungen der Gerbsäuren, Glucoside, Phlobaphene und Harze*, Ann. der Chemie und Pharm., Bd. CXLIII, 1867, S. 295—from these and his own investigations, concluded that tannin is really composed of two equivalents of gallic acid less one of water, so that it may be regarded as a digallic acid. The experiments of SACK—*Recherches sur la formation de l'acide gallique*, Comptes rendus, T. LXXII, 1871, p. 766—point strongly in the same direction. He found that a sample of powdered galls yielded to ether 43 per cent. of pure dry tannic acid, while some of the same lot yielded, after three months' fermentation with water, 50 per cent. of pure dry gallic acid. He concluded, therefore, that the change was one of simple hydration, and that "tannic acid is probably only the anhydride of gallic acid." A similar conclusion has been reached by H. SCHIFF, whose work appeared so important to A. WURTZ that he translated it into French—*Sur la nature et la constitution de l'acide tannique*, Ann. de Chimie et de Physique, T. XXV, 1872, p. 182. SCHIFF concludes: "Tannic acid is an alcoholic anhydride of gallic acid, that is to say very probably of digallic acid."

¶ W. BAYES—*On gallic acid*, [read before the Medico-Chirurgical Society of Brighton and Sussex, Nov. 3, 1853.] Association Med Jour., Vol. for 1854, p. 596—commended it in both diarrhœa and dysentery, and appears to have preferred it chiefly on account of "the ease and rapidity with which it enters the blood." G. H. YOUNG—*On asthenic dysentery*, Dublin Quart. Jour. of Med. Sci., Vol. XX, 1855, p. 70—advised gallic acid in asthenic dysentery: "Gallic acid to allay the hemorrhage, quinia to support the sinking powers of life, and opium as the *sine quâ non* in any treatment of dysentery"—p. 73. T. H. TANNER—p. 664, *op. cit.*, p. 751, *supra*—mentions it among other astringents in connection with the treatment of advanced dysentery: "Bismuth, gallic acid, kino, logwood, iron alum, or sulphate of copper."

** Even when tannic acid is given, it is only the gallic acid into which it is transformed that is absorbed, and after absorption excreted by the kidneys; see the authorities cited in note ¶, p. 766, *supra*.

influence to that circumstance. Far less likely to disturb the stomach than tannin, it may be given in the dose of ten grains to half a drachm, or even more, three times daily, without any injurious effect.* But no more from it than from tannin is any very positive restraining influence upon the bowels to be expected;† and indeed it may well be doubted whether it is worth while to resort to it or to any of the vegetable astringents, except in mild fluxes dependent upon mere irritation or subacute inflammation of the intestinal mucous membrane, and even in these it will often be found the desired effect can be more satisfactorily attained by other means. The great reputation these medicines enjoyed in former times was probably due chiefly to the circumstance that they were almost always given in combination with opium, and the injurious effects they were so often accused of producing, when used prematurely in dysentery, were doubtless caused to a great extent by the constipating influence of that powerful drug.

Besides its role as a mild astringent in the conditions just indicated, gallic acid may perhaps prove useful in controlling hæmorrhages from the bowels arising during the progress of any of the alvine fluxes. Morehead has related one case of hæmorrhagic dysentery, that occurred in the practice of Leith, in which this plan of treatment was employed with success, and Alde has reported another, but Gordon has testified to its trial without success in similar cases:‡ and it must be admitted that the determination of its precise range of usefulness in such hæmorrhages requires further study.

*Mineral astringents.*—Of the substances belonging to this group *alum* was commended, in the writings of Ætius, as a readily obtainable remedy useful in chronic dysenteries and in those accompanied with bloody discharges; he directed it to be rubbed up with an egg and given with draughts of warm water.§ This combination was still occasionally used in dysentery as late as the latter part of the sixteenth century, when it was advised in the treatise of Hollerius.‖ We have the testimony of Schrœder that during the seventeenth

* According to MITSCHERLICH—S. 242, *op. cit.*, p. 765, *supra*—large doses of tannic acid (half an ounce) administered to rabbits produce a local caustic effect on the gastric and even the intestinal mucous membrane, and death soon follows. SCHROFF—*Lehrb. der Pharm.*, IIte Aufl., which I have not seen, and quote from CLARUS—S. 480, *op. cit.*, p. 766, *supra*—obtained similar results, but according to him gallic acid produces much slighter effects upon the gastro-intestinal mucous membrane of these animals. BAYES—*loc. cit.*, note ¶, last page—states that "when an overdose of gallic acid has been taken, [by a human subject,] the pulse becomes small and wiry, the face grows pallid, a whizzing sound is heard in the ears, the head feels dizzy, and faintness supervenes." He attributed these symptoms to an astringent effect exercised upon the cerebral vessels, and adds: "But I conceive it would not be possible to poison a patient by the largest dose of the remedy when introduced by the mouth, because the capillary and distal vessels would become too contracted to receive any further supply, long ere a sufficient quantity could be carried into the blood to produce dangerous effects upon the central circulation." One of the advantages he claimed for gallic acid was "the perfect safety with which the largest dose may be administered." However lightly we may esteem the speculations of this writer, his practical suggestions are well worthy serious consideration.

† SIMPSON, indeed, is reported to have said in the Medico Chirurgical Society of Edinburgh, April 19, 1843—The Lond. and Edinb. Monthly Jour. of Med. Sci., Vol. III, 1843, p. 661—while recommending gallic acid in menorrhagia: "It had this advantage over most other anti-hemorrhagic medicines, that it had no constipating effect upon the bowels."

‡ MOREHEAD—p. 308, *op. cit.*, p. 657, *supra*—reports but a single case of this kind treated with gallic acid and tincture of catechu—the latter an unnecessary addition: "Eight grains of the former and two drachms of the latter were given every hour and a half alternately, and port wine was at the same time freely used. The case was one of hæmorrhagic dysentery, with adynamic phenomena, in a European officer, and recovery was complete." ALDE—*Traitement de la dysenterie par l'acide gallique*, Annuaire de Thérapeutique, 22e année, Paris, 1862, p. 148—relates another successful case: A young Damascene suffering from dysentery in Alexandria, Egypt, was treated by him with ipecacuanha and opium; and troublesome hæmorrhage, which occurred several times during the progress of the case, was readily controlled with gallic acid. A bilious diarrhœa remaining, after the violence of the attack had subsided, was checked by a combination of tannin and bismuth. C. A. GORDON—*Experiences of a regimental surgeon in India*, The Med. Press and Circular, Vol. VII, 1869, p. 179—says of LEITH'S method as reported by MOREHEAD: "This plan was, with many others, tried in the 10th Regiment, but, unhappily, without the success attributed to it by the author named."

§ ÆTIUS—Tetrab. III, Serm. I, Cap. 48, p. 612, Ed. cited p. 656, *supra*: "Aliud parabile. Alumen liquidum tritum cum ovo absorbendum præbe, et rursus aqua calida dilutum bibendum exhibe, et admiraberis. Sedat diuturnas dysenterias, et in quibus cruenta excernuntur." The styptic virtues of alum were early recognized by the Greeks, as is indicated by the name they gave it, stypteria, [στυπτηρία,] which, as we are told by GALEN, implies astringency: "Hujus medicamenti nomen ab astrictione deductum est, nam adest illi vehementissima"—*De simp. med. temp. ac fac.*, Lib. IX, Cap. 3, § 30, [Ed. Kühn, XII, 236.] He enumerated it among the substances which favor the cicatrization of ulcers without acting as caustics—same treatise, Lib. V, Cap. 15, [Ed. Kühn, XI, 756,]—and frequently used it as an ingredient of clysters, but does not appear to have administered it internally in the fluxes. I presume, with ADAMS, in his commentary on the account of alum given by PAULUS ÆGINETA—Lib. VII, Cap. 3, Ed. cited p. 624, *supra*, Vol. III, p. 360—that the Greeks understood by alum chiefly the same substance we now call by that name, though perhaps they may have included other substances, such as sulphate of iron, and alum contaminated with various impurities.

‖ HOLLERIUS—*De morb intern.*, Lib. I, Cap. 40, fol. 122, *ap. cit.*, p. 680, *supra*. His formula was, "alumen tritum 3j pondere ex ovo." This recommendation and the passage from ÆTIUS are cited by SENNERTUS—T. III, p. 177, *op. cit.*, p. 645, *supra*—who, however, does not appear to have employed the remedy.

century alum was employed by some physicians as an astringent in dysentery;* but this practice could not have attained any great notoriety, for I have found no allusion to it in any of the treatises on dysentery of that age I have consulted.

During the latter part of the last century, and the beginning of this, alum came into more general use for this purpose. About the year 1784 Adair employed it in an epidemic of dysentery, and regarded it as the safest astringent he had tried.† Birnstiel, in 1786, lauded a combination of alum and camphor as a prophylactic against dysentery;‡ Michaelis gave it in powder or dissolved in whey with alleged advantage in the Harburg dysentery of 1797;§ and Leib attributed to it the cure of a case of chronic dysentery which he treated in 1791.‖ Moseley employed alum in combination with sulphate of zinc, not only in chronic diarrhœa and dysentery, but also in the early stages of slight dysenteries, and even of more serious cases, when for any reason his favorite sudorific process could not be put into practice.¶ Other combinations of this salt were employed in dysentery by Hargens and Loos.** Moseley's mixture appears to have found most favor, and Jackson, in 1817, still reckoned it among the useful remedies.††

The purgative effect of large doses of alum had been recognized by Cullen,‡‡ as well as by Adair, but neither regarded this a contraindication to their use. On the other hand, Quarin regarded it as unsuitable in dysentery for this among other reasons; while Fournier and Vaidy pointed out as a further objection that it augmented the abdominal pains.§§ Bampfield especially criticised the combination used by Moseley, declaring that it is difficult to adapt the proportion of alum to the astringent effect desired; that when it constipates the tormina are increased; and that it sometimes induces an actual relapse.‖‖

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* J. SCHRŒDER—*Pharmacopœia Med.-Chym.*, Ulm, 1641; I cite from the extracts on alum in the work of MANGETUS—T. II, p. 755, *op. cit.*, p. 736, *supra*, and the 4th German edition of SCHRŒDER'S book, Theil II, Nuremberg, 1747, S. 967: "A few give alum also in bloody dysentery, (in der rothen Ruhr:)" he states also that certain empirics gave it internally in fevers.

† JAMES ADAIR in a letter to A. DUNCAN—Med. Comm. for the years 1783-84, Vol. IX, London, 1785, p. 209. He gave it in the dose of 10 to 30 grains, and says: "In a late epidemic dysentery, I used it with advantage; the vitriolic acid combined with earth of alum renders it sedative and antiseptic; and as it is at the same time eccoprotic, in a large dose, it is the safest astringent I have hitherto tried. Dr. Percival's remarks on this drug, led me to try it early and boldly." On account of "its ungrateful stimulus in the stomach," he mitigated it "by spermaceti, gum arabic, or opium." Now I note that PERCIVAL—*Essays;* I cite the 4th Ed., Vol. I, London, 1788, p. 401—who, following the example of J. GRASHUIS—*De colica pictonum*, Amsterdam, 1755—gave alum in lead colic, commends it only "in various painful affections of the bowels, of the chronic kind, and not attended with inflammatory symptoms"—p. 406.

‡ F. H. BIRNSTIEL—*De dysenteria liber*, Mannheim, 1786, p. 311 *et seq.*

§ MICHAELIS—*Epidemische Constitution zu Harburg*, Hufeland's Jour., Bd. VI, St. I, Neue Aufl., 1811, S. 180.

‖ M. LEIB—*Case of dysenteria chronica cured by alum*, Trans. of the College of Physicians of Philadelphia, Vol. I, Part I, 1793, p. 225. He gave it with opium and Peruvian bark, but remarks: "Lest it might be supposed that the cure was owing to the other medicines which were exhibited with the alum, it may be proper to remark, that they were administered for a long time without the alum, and without effect." In this, as in so many other cases, the last remedy tried was duly credited with the cure.

¶ MOSELEY—p. 384, 2d Ed., 1789, and p. 386, 3d Ed., 1792, *op. cit.*, p. 648, *supra*—dissolved three drachms of sulphate of zinc with one of rock alum and three grains of cochineal in a pound of hot water, and strained or filtered. Dose from a teaspoonful to a tablespoonful, to be taken in the morning fasting, and in some cases to be repeated every six hours. "This," he remarks, "I have found far more efficacious in the dysentery, than emetic tartar, ipecacuanha, rhubarb, or salts, as evacuants, in whatever manner combined, or administered." He varied the proportions according to circumstances, diminishing or omitting the alum "when evacuations are required," and increasing it "when great astringency is required." The emetic effect often produced did not daunt him, and when it griped, as it sometimes did, he tried to check that effect with laudanum.

** HARGENS—*Ueber die epidem. Constitution zu Kiel, etc., im Jahr* 1798, Hufeland's Jour., Bd. VII, St. 3, 1799, S. 137—advised half a grain of opium with 10 to 15 grains of alum, to be taken as many times daily as the circumstances of the case seemed to indicate. LOOS—*Kurze Bemerk. über einige verkannte Arzneimittel*, Horn's Archiv, Bd. IX, 1810, S. 193—commended a combination of alum with opium, to be given in a decoction of tormentil root and oak-bark.

†† R. JACKSON—*Febrile Diseases*, London, 1817, p. 442: "Angustura bark, arnica, gentian, camomile, etc., camphorated mixture with white vitriol and alum and acetated water of ammonia given at frequent intervals, may be reckoned among useful remedies: they contribute materially to accelerate recovery and to secure against the chances of relapse." In the second edition of his work, London, 1820, Vol. II, p. 60 *et seq.*, this passage is omitted, but injections of white vitriol and alum are commended on p. 64.

‡‡ CULLEN—Vol. II, (1789,) p. 17, *op. cit.*, p. 740, *supra*—wrote: "I am surprised to find that it seems not to have been employed with other astringents in diarrhœa. Some materia medica writers indeed mention its being suited to cure this disease; but I have not met with any practical writer who prescribes it in such cases." On the next page he remarks: "It is ready to irritate the stomach: and in several instances I have found it rejected by vomiting; and what is more extraordinary, I have known large doses of it operate as a purgative." He does not allude to its use in dysentery, in which, as he thought all astringents hurtful, he would not have thought of resorting to it.

§§ J. L. B. DE QUARIN—*Animadversiones Practicæ in Diversos Morbos*, (1786,) Ed. aucta, Vienna, 1814, T. II, p. 220: "Alumen, quod putredini adversatur, et colliquationem humorum impedit in dysenteria putrida non convenit, cum alvi fluxum moveat." FOURNIER et VAIDY—p. 384, *op. cit.*, p. 362, *supra*.

‖‖ BAMPFIELD—p. 197, *op. cit*, p. 682, *supra*.

These representations served to limit the use of alum as an internal remedy in the fluxes, and it has rarely been employed in this way in recent times.* Increased knowledge of its mode of operation has only served to increase the objections to its use. Swallowed in small doses it forms precipitates with the gastro-intestinal secretions and contents, and the mucous membrane is thus protected from its injurious action; but in larger doses the excess provokes serious gastro-intestinal irritation, and colicky pains accompany the vomiting and purging that result; long continued, it is capable of producing a grave gastro-intestinal catarrh.† It seems, therefore, ill-adapted for internal use in the fluxes, although, as the irritant is expelled with the evacuations, it is usually administered with impunity when the alimentary canal is free from disease.

The *astringent salts of iron* were first brought into notice in connection with the treatment of the fluxes by the iatro-chemists. It has already been mentioned that the Greek physicians quenched red-hot cylinders of iron in whey or milk for the purpose of giving it astringent and corroborant qualities.‡ Dioscorides praises the use of water or wine, similarly treated, in the fluxes.§ These remedies continued in use for many centuries. J. Crato, indeed, writing of a case of alvine flux treated in 1567, advised that chalybeated drinks should be avoided in dysentery, because they do not astringe, as physicians falsely think, but perturb the belly; his views convinced Plater and Hildanus, but Sennertus stoutly maintained that chalybeates should not be abandoned.‖

Meanwhile Paracelsus and the iatro-chemists had brought into use a host of chalybeate preparations, many of which, especially the various forms of sal Martis, vitriolum Martis, crocus Martis and diversely compounded tincturæ Martis, they boldly employed as astringents in dysentery.¶ So freely were even the more potent of these compounds adminis-

* I note that Surgeon CHARLES SCHÜSSLER—p. 44, *supra*—claimed to have found it useful in the chronic fluxes at hospital No. 6, Nashville, Tenn., during the year 1862; and GORDON—p. 179, *op. cit.*, p. 769, *supra*—in 1869, recommended a solution of alum, with diluted sulphuric acid added, among the remedies to be used in hæmorrhagic dysentery, "where gallic acid fails to check the flux."

† Thus MITSCHERLICH—Bd. I, S. 324, *op. cit.*, p. 765, *supra*—found in rabbits poisoned with alum the intestines inflamed and corroded, (angeätzt.) He states that large or long-continued doses produce the effects mentioned in the text. Yet even he commends it in chronic diarrhœa, and in dysentery after the inflammatory symptoms have subsided—S. 326. ORFILA—T. I, p. 366 *et seq.*, *op. cit.*, p. 699, *supra*—observed as early as 1814 that large doses of alum given to dogs acted as an emetic, but did not produce a fatal result. Subsequently (in 1829) he found that if by ligature of the œsophagus or "by any other cause" vomiting was prevented, death took place in a few hours, and the mucous membrane of the digestive canal was found greatly inflamed. ORFILA found furthermore that after the exhibition of large doses of alum to dogs it could be detected in the urine and in the viscera after death, and hence inferred that it can be absorbed, although from the mode in which it precipitates albumen this would hardly have seemed probable. (I observe that my friend H. C. WOOD—p. 32, *op. cit.*, p. 675, *supra*—was unable to discover the authority for this statement, which, however, is correctly attributed to ORFILA by MITSCHERLICH and NOTHNAGEL in the works cited in this note.) CLARUS—S. 169, *op. cit.*, p. 766, *supra*—contradicted this observation of ORFILA, and declares that after the administration of alum, no trace (keine Spur) of it can be found in the urine. He agreed, however, with MITSCHERLICH as to the irritant and corrosive effect of large doses: he only advised its use in dysentery as an ingredient of clysters. NOTHNAGEL—S. 311, *op. cit.*, p. 746, *supra*—testifies that, given to healthy men in very large doses, alum produces the symptoms of an acute toxic gastro-enteritis. See also STILLÉ—Vol. I, p. 172 *et seq.*, *op. cit.*, p. 711, *supra*, and BUCHHEIM—S. 210 *et seq.*, *op. cit.*, p. 746, *supra*.

‡ See p. 664, *supra*.

§ DIOSCORIDES—Lib. V, Cap. 93, fol. 288, *op. cit.*, p. 623, *supra*: "Vinum aquave in qua candens ferrum sit restinctum, potu cœliacis, dysentericis, lienosis, cholera laborantibus, et dissolutis stomacho auxiliatur." Water thus treated is praised by PLINY, especially in dysentery. PLINY—*Nat. Hist.*, Lib. XXXIV, Cap. 44, Valpy's Ed., London, 1826, Vol. IX, p. 4505: "Calefit etiam ferro candente aqua, multis vitiis, privatim vero dysentericis."

‖ J. CRATO—*Consil.* 201; I quote from L. SCHOLZIUS—*Consil. Med.*, Frankfort, 1598, p. 579. Nevertheless he favored injections of whey in which iron had been quenched: "In recta victus ratione nihil prætermittatur, nec detur potus chalybeatus, ut fieri solet. Non enim is astringit, ut falso existimant medici, sed turbat alvum. Serum autem lactis, in quo chalybs extinguitur, per clysterem injiciatur, qui alvum sistit." FELIX PLATER wrote a letter to FABRICIUS HILDANUS—published by the latter p. 679, *op. cit.*, p. 644, *supra*—in support of this view, and HILDANUS, while he confessed—p. 680—that he had for many years given chalybeated water to dysenterics, abandoned the practice, and claims that he succeeded better without it. SENNERTUS devoted a special dissertation to this question—Quæstio VI. *An chalybis usus in dysenteria conveniat*, T. III, p. 189, *op. cit.*, p. 645, *supra*—and not only concluded that chalybeated milk, water and wine may advantageously be used in moderation, but even favored the cautious use of crocus Martis and other chalybeate preparations introduced by the chemists. At the conclusion of this essay he refers to the black color of the stools produced by the chalybeates, and censures the incautious physicians who mistook it for black bile.

¶ Many of these preparations are already discussed in the writings of PARACELSUS. Here we find mention of two varieties of crocus Martis—*De morte rerum nat., Lib. V*, T. II, p. 92, Ed. cited p. 336, *supra*. Here, too, we find the varieties of vitriol discussed—*De sulphure*, Cap. VIII, same Vol., p. 209 *et seq.*—the copper sulphate, regarded as related to the iron sulphate, valuable purgative properties assigned to crude vitriol and coleothar, and the mode of distilling oil of vitriol thence, described. The fifth essence of iron was an ingredient in his specific styptic—*Archidox.*, Lib. VII, same Vol., p. 28—which was so potent that he had known it, administered as a rude jest, to close the anus so completely that mechanical assistance was necessary to open the bowels. It would transcend my limits to discuss at length the teachings of PARACELSUS and the iatro-chemists with regard to the preparations of iron. I confine myself to the citation of a few striking passages: QUERCETANUS—p. 244, *op. cit.*, p. 736, *supra*—described two varieties of crocus Martis, the one astringent, useful in dysentery and lientery, the other aperient, and capable of purging from the spleen and mesentery. OSWALD CROLL—

tered that the frequency with which they provoked diarrhœa gave rise to the belief that certain chalybeates might be used advantageously as purgative medicines.*

The astringent effect of these preparations was chiefly aimed at in the treatment of the alvine fluxes; but with the exception of the iatro-chemists and their disciples, most physicians hesitated to employ them. Degner declared that the use of all chalybeates was to be regarded with suspicion or rejected as noxious, except, perhaps, the tincture of Ludovicus, which, however, he thought useful rather as a corroborant at the close of the disease than as a means of cure.† Partly because his views were shared by others, but chiefly no doubt because preference was given to other astringents, iron was little used in the treatment of the fluxes during the latter part of the last century or the beginning of this; but during the last forty years it has again been brought into use, both with a view to its astringent effects and to improving the quality of the blood in anæmic cases.

For the first of these objects the old use of *sulphate of iron* has been revived, and it has been administered, chiefly in connection with opium, in the later stages of acute dysentery and in the chronic fluxes. It was mentioned by Copland and Vogt, although without particular commendation, among the mineral astringents occasionally employed in dysentery, and has been used also in other fluxes, as, for example, by Leube in intestinal catarrh and by Weiser in the diarrhœa of infants.‡ The *tincture of the chloride of iron*, another old preparation, has also been used to a limited extent for the same purposes.§

But far greater popularity has been attained in modern times by certain other astringent chalybeates. In England the preference has generally been given to *solution of pernitrate of iron*, which was recommended in diarrhœa by Kerr, (1832,) and in chronic fluxes by Graves, Neligan and Maclean, as well as by Adam in this country.‖ In France the favorite

pp. 349–50, *op. cit.*, same page, *supra*—had ao essentia eroci Martis which cured diarrhœa and dysentery as well as external and internal hæmorrhages of all kinds. ANDREAS LIBAVIUS—*Appendix necessaria Syntagmatis Arcanorum Chymicorum*, Frankfort, 1615—wrote at length on the preparations of iron. He claimed that water, wine, vinegar and the like, in which iron or steel had been extinguished, were undoubtedly beneficial in the alvine fluxes, brought forward authorities in favor of this view and combated objections—*Syntag. Arcan. Chym.*, Pars III, Lib. I, Cap. 10, p. 20, *op. cit.* He treated in extenso of crocus Martis—Lib. V, Cap. 22, p. 198—of which there are several varieties, differing not only in appearance but in therapeutical effects: there is a tincture of crocus Martis possessed of powerful astringent properties—p. 200; see also his remarks on sal Martis—Lib. VI, Cap. 22, p. 254—and tinctura Martis—Lib. VIII, Cap. 16, p. 401—which cures dysenteries. The curious reader will find a good deal of information with regard to the preparations of iron introduced by the iatro-chemists in the work of MANGETUS—T. I, p. 917 *et seq.*, *op. cit.*, p. 736, *supra;* the *Dictionary* of JAMES—art. *Mars.*, *op. cit.*, p. 690, *supra;* the *Dispensatory* of QUINCY—p. 253 *et seq.*, *op. cit.*, p. 730, *supra*, or Part II, p. 77 *et seq.*, *op. cit.*, p. 734, *supra;* and the work of C. ALSTON—*Lectures on the Materia Medica*, London, 1770, Vol. I, p. 135 *et seq.* It is sufficient for our present purpose to say that the various forms of crocus Martis represented the sesquioxide of iron in various degrees of purity; the sal Martis or sal chalybis was the artificially prepared sulphate of iron; the term vitriolum Martis was applied to the same, as well as to the native sulphate, while the tincturæ Martis were prepared in various ways from the crocus or other preparations, and were of the most various strength.

* This view was already formulated by PARACELSUS—*De Sulphure*, *loc. cit.*, last note—and was discussed by many of the iatro-chemists and others. JAMES—*loc. cit.*, last note—wrote as late as 1745: "Physicians now acknowledge a twofold virtue in iron, one aperient, the other astringent;" and adds: "Some attribute an aperient virtue to some preparations of iron, and an astringent virtue to others; but the truth is, all these preparations are both astringent and aperient, though not in the same degree."

† DEGNER—Cap. V, § 18, p. 273 *et seq.*, *op. cit.*, p. 625, *supra*. The tinct. vitriol. Martis Lud. of which he speaks was perhaps the solution of sulphate of iron in distilled vinegar described by D. LUDOVICUS—*De pharm. modern. seculo applicanda Diss. I*, (1671,) Opera Omnia, Leipsic, 1712, p. 517—perhaps one of the tinctures described in his *Diss. de vol. salis tartari*, (1667,) *op. cit.*, p. 855, among which I note already a solution of flores Martis in spiritus salis, that is substantially a solution of chloride of iron.

‡ COPLAND—Vol. I, p. 730, *op. cit.*, p. 682, *supra;* VOGT—S. 206, *op. cit.*, p. 645, *supra*. LEUBE—S. 276, *op. cit.*, p. 750, *supra*—after declaring that experience has shown the beneficial action of astringents in this disease, enumerates, among those most commonly used, acetate of lead, nitrate of silver, tannin, alum, sulphate of iron, (10 to 20 centigrammes per dose,) and solution of the sesquichloride of iron, (5 to 8 drops per dose.) K. WEISER—*Ueber die Behandlung des Durchfalls bei Säuglingen*, Wiener Med. Wochenschrift, 1871, S. 849.

§ This tincture was devised not long after the discovery of muriatic acid by GLAUBER—see note ‡, p. 706, *supra*. The earliest direction for its preparation with which I am acquainted was given by BATE—I cite from W. SALMON—p. 238, *op. cit.*, p. 730, *supra*—who called it *tinctura Martis aurea*. He directed an ounce of crocus Martis to be infused in four of spirits of salt, and four ounces of rectified spirits of wine to be added. As late as 1850 the U. S. Pharmacopœia still directed this preparation to be made by treating the subcarbonate of iron with muriatic acid and adding alcohol.

‖ WM. KERR—*On the use of the persesquinitrate of iron in diarrhœa, and some other affections of the mucous membrane of the alimentary canal*, Edinburgh Med. and Surg. Jour., Vol. XXXVII, 1832, p. 99; *Additional evidence of the efficacy of the persesquinitrate of iron in curing diarrhœa*, Glasgow Med. Jour., Vol. V, 1832, pp. 215 and 375; *On the medicinal effects of the persesquinitrate of iron*, Monthly Jour. of Med. Sci., Vol. VIII, 1848, p. 784. R. J. GRAVES—*Clinical Lectures*, Lect. XII, Lond. Med. and Surg. Jour., Vol. VII, Part 2, 1835, p. 513, and *Clinical Lectures*, 2d Ed., London, 1848, Lect. LII, Vol. II, p. 226; J. M. NELIGAN—*Medicines, their uses, &c.*, American reprint, New York, 1844, p. 65. MACLEAN—Vol. I, p. 124, *op. cit.*, p. 657, *supra*—in speaking of the treatment of chronic dysentery, writes: "My favourite remedy, particularly in men returning from tropical regions, anæmie from loss of blood and the depraving influence of malaria, is the solution of the pernitrate of iron, which I use at Netley very freely, and often with the happiest effect." T. C. ADAM—*On the remedial powers of the persesquinitrate of iron*, Amer. Jour. of the Med. Sci., Vol. XXIV, 1839, p. 61.

preparation has been the *perchloride of iron*, to which attention was directed in 1856 by Deleau, as a remedy in blenorrhagic affections of the mucous membranes. The following year Pize reported that it had been successfully used in diarrhœa by several other physicians as well as himself. It has been employed in dysentery by Bourguignon, Baudon, Savignac, Barrallier and others.* Savignac and Barrallier went so far as to express the opinion that it is the only mineral astringent admissible in this disease. Méran, indeed, found that in two cases it provoked severe colic, and had to be abandoned; yet even he regarded it as admissible in chronic fluxes.† The *persulphate of iron* has also had its advocates, though it has been less generally employed.‡

Several of these preparations of iron were occasionally used in the treatment of chronic fluxes by military surgeons during our civil war; the sulphate was least frequently employed; the tincture of the chloride and the persulphate had each more numerous advocates, some of whom even claimed for them a place among the most efficient remedies for these disorders. But the great majority of medical officers avoided this use of the salts of iron, and a few, after fairly trying them in such cases, abandoned them because they did not obtain satisfactory results.§ I suspect that had these salts been more generally used for their astringent effects, the complaints of failure would have been still more numerous.

Abundant testimony with regard to inconveniences and even injurious effects from the continuous use of notable doses of the astringent salts of iron has been collected by the systematic writers on therapeutics. When the quantity administered is sufficient to produce

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* DELEAU—*Mémoire sur l'action du perchlorure de fer dans certaines maladies*, La France Méd. et Pharm., 1856, p. 251—declared: "Que le perchlorure de fer est un modificateur des tissus vivants, mais surtout modificateur thérapeutique des membranes muqueuses dans les blennorrhagies et dans les leucorrhées;" moreover, he asserted that there is no danger in its internal use. The following year L. PIZE—*Mém. sur l'action thérapeutique et physiologique du perchlorure de fer*, Moniteur des Hopitaux, T. V, 1857, p. 142—stated that the perchloride of iron had been found efficacious in certain diarrhœas by several other physicians as well as himself. A dispute as to the priority ensued between him and DELEAU—same Vol., pp. 159 and 223. In June, 1857, DELEAU read a memoir on this salt to the Academy of Sciences—same Vol., p. 677—in which he maintained the conclusions of his first paper. In his *Études cliniques sur le perchlorure de fer*—same Vol., p. 2064—he published two cases of dysentery successfully treated with this preparation by BOURGUIGNON, de Béthisy-Saint-Pierre, (Oise.) A. BAUDON—*De l'emploi du perchlorure de fer dans la dyssenterie*, Bull. Gén. de Thér., T. LXI, 1861, p. 464—employed "ce précieux médicament" successfully in twelve cases of dysentery, giving 12 to 30 drops daily in 180 grammes of sweetened water, divided into convenient doses, and using the drug also in enemata. SAVIGNAC—p. 400, *op. cit.*, p. 620, *supra*—admits, however, that he found it far from realizing theoretical hopes, and commends it chiefly in hæmorrhagic cases. BARRALLIER—p. 771, *op. cit.*, p. 603, *supra*. For other favorable testimony I may refer to the statement of its beneficial use in the Vienna hospital, in 1864, in dysenteries passing into a chronic condition, in the Aerztlicher Bericht des k. k. allg. Krankenhauses zu Wien, 1864, Vienna, 1865, S. 58, and a lecture of C. PAUL—*Leçon sur la dysenterie*, Gaz. Méd. de Paris, T. XXV, 1870, p. 536—who commended it especially in hæmorrhagic dysentery. It has also been advised in the treatment of choleriform diarrhœa by DELEZENNE—*Perchlorure de fer contre la diarrhée*, Gaz. des Hopitaux, 39e année, 1866, p. 450—and LAWSON is said to have used it with advantage in summer diarrhœas resulting from the use of impure water or unwholesome fruit: see an article entitled *Diarrhœa and its treatment at the London hospitals*, Med. Times and Gaz., Vol. II for 1868, p. 122.

† MÉRAN—*loc. cit.*, p. 676, *supra*—reported to the Bordeaux Medical Society, Nov. 7, 1859, that in the two cases of dysentery in which he tried the use of raw meat he also tried perchloride of iron in the later stages, but the colics, which had subsided, briskly returned, and he had to abandon it. He concluded that the remedy should not be used except in chronic cases, or at least after the acuteness of the inflammatory accidents had subsided; in the indolent dysentery of children it acted better. DUPUY stated to the same meeting that a patient, to whom he had given the perchloride, suffered from vomiting, but that on giving it more dilute it was well borne, (parfaitement tolerée.)

‡ Monsel's salt: see MONSEL—*Nouveau per-sulfate de fer soluble*, Jour. de Méd. de Bordeaux, 1857, p. 291.

§ See, on this subject, the views of the reporters in Section II of this chapter. The sulphate of iron was praised by SCHÜSSLER—p. 44, *supra*—who, however, used indifferently the chloride and the persulphate. On the other hand, BIGELOW—p. 83—reports that he used the sulphate without effect. The tincture of the chloride of iron was employed by MCDONALD—p. 78; BROWN—p. 81; and BRADT—p. 100. The persulphate of iron was used by DE BRULER—p. 42; B. WOODWARD—p. 51; BRETZ—p. 80; WALTON—p. 88; and COOPER—p. 93: WELCH—p. 96—even commended this salt, in combination with opium, in the treatment of acute dysentery. See also the paper of E. L. JONES, (Asst. Surgeon 53d Wisconsin.)—*On diarrhœa as seen in the camps*, Chicago Med. Jour., Vol. XXII, 1865, p. 246—who praises the use of the tincture of the chloride of iron in camp diarrhœa, and that of J. R. LOTHROP—*Report of the Buffalo General Hospital*, Buffalo Med. and Surg. Jour., Vol. V, 1866, p. 21—who gives the following testimony with regard to the treatment of diarrhœa in that hospital: "The astringent preparations of iron were more employed than any other medicines, and particularly the muriated tincture of iron. Continued for a long time more benefit was perceptible from it than from any other medicine." On the other hand, the persulphate of iron has been praised by J. DAVIS—*Hospital reports. Commercial hospital. On the use of persulphate of iron in diarrhœa*, Cincinnati Lancet and Observer, Vol. V, 1862, p. 597—who reported six cases of chronic diarrhœa in which it was used: four recovered, one left the hospital in an improved condition and one died. O. C. GIBBS, (late Surgeon 21st New York,)—*Persulphate of iron in camp diarrhœa*, same Jour., Vol. VI, 1863, p. 462—praises the same remedy, remarking: "I had every reason to be pleased with the result. At first the remedy was used in one-grain doses, but those were soon increased to two and three, and, in some cases, as high as five-grain doses. I never saw harm result from its use." He gave it combined with opium. In the tract of STILLE—p. 379, *op. cit.*, p. 650, *supra*—I find the following directions for the use of iron in chronic dysentery: "Finally, when anæmia complicates the disorder of the bowel, and bitter vegetable preparations fail to invigorate digestion, iron should be prescribed, and particularly the preparations which possess a marked astringency, as the muriated tincture, the persesquinitrate, and the perchloride." PENROSE, however—p. 45, *supra*—reports that he employed the salts of iron in chronic fluxes at Satterlee hospital "without satisfactory results;" which corresponds with the experience of BIGELOW—cited *supra*—as to the use of the sulphate.

temporarily a recognizable restraining effect upon the stools they perturb the digestive processes, and if their use is persisted in they are prone to irritate the intestinal canal. Under such circumstances they often produce intestinal catarrh, manifested by gripings and diarrhœa, even in those whose bowels were healthy when the treatment was begun.* In the fluxes still smaller doses will be found to irritate the intestines, and if by their means a temporary arrest of the discharges be sometimes effected, a relapse is apt to follow, with increased violence of all the symptoms.

I do not, however, feel any doubts with regard to the usefulness of chalybeate preparations, when prudently administered, for the purpose of increasing the proportion of the red blood corpuscles in anæmic conditions concomitant with the advanced stages of the chronic fluxes; but I cannot agree with Stillé, that for this purpose the astringent salts should be selected.† On the contrary, I think that preference should be given to those mild chalybeates which experience has shown are least likely to perturb the stomach and bowels. The phosphate, the lactate, the oxalate and the sesquioxide are better suited for this purpose than the more potent astringent salts; and even these preparations should be administered in small doses, as little as possible in excess of the quantity that can be absorbed. The citrate of iron and quinia often proves an excellent combination in these cases.

The *sulphate of copper*, also, was brought into use in the treatment of the fluxes by Paracelsus, who embraced it along with iron sulphate under the head of vitriol, which he declared to be a peculiar genus, diverse in its virtues from all other salts, and attributed to it marvellous medicinal powers, asserting that rightly used it was worth more than all the drugs of Greece, Egypt or India. He ordered vitriol to be given in dysentery in such doses that it should cause both vomiting and purging,‡ and it is by no means strange that this reckless practice should have found few imitators. Near the middle of the last century Geoffroy wrote that copper is little used internally in medicine, but belongs to the poisons; it produces pains and colics in the stomach and bowels, enormous vomitings, frequent and vain desire to go to stool and intestinal ulceration.§ On the other hand, Alston, having swallowed by direction of an empiric, half a drachm of sulphate of copper and escaped serious consequences, declared his belief that copper is no more a poison than iron, and that it cannot cause ulcerations of the intestines, but would rather cure them.‖ This hint, however, did not attract attention at the time, and it is only in the present century that sulphate of copper has been brought into common use in the chronic fluxes.

Although by no means the first to employ it for this purpose, Elliotson deserves the credit or blame of having introduced it into general notice. He gave it in chronic dysen-

* See the account of these inconveniences in the works of MITSCHERLICH—Bd. I, S. 349 *et seq.*, *op. cit.*, p. 765, *supra;* CLARUS—S. 269 *et seq.*, *op. cit.*, p. 766, *supra;* NOTHNAGEL—S. 428 *et seq.*, *op. cit.*, p. 746, *supra;* and BUCHHEIM—S. 215 *et seq.*, *op. cit.*, p. 746, *supra.* The same authors may be consulted on the general question of the therapeutical action of iron.

† See note §, last page.

‡ PARACELSUS—*De sulphure, Cap.* 8, T. II, p. 200 *et seq.*, *op. cit.*, p. 336, *supra.* It is clear from his remarks, *De specibus vitrioli*, that he preferred an impure vitriol, composed only in part of sulphate of copper, for while he insists on its depositing copper on iron as an alchymical test of its nature, (which he interpreted as a transformation of iron into copper by the action of vitriol,) he remarks that a vitriol which is blue throughout, without intermixture of other colors, is not so excellent in medicine. As to its use in dysentery, &c., he wrote: "Per vitam militarem ex immoderatione frequenter etiam accidit, ut pruncllæ, febres, dysenteriæ, et alia oriantur. In his morbis omnibus summum est præstantissimumque remedium purgatio per vitriolum, quod tecte et allegorice vocitarunt Gryllum." The dose should be six times as much as can be taken on the point of a knife; if it do not operate, this should be repeated a second or even a third time, but not oftener. It may be given to the feeble in wine or water, but to robust men of stronger bowels (durioris alvi) in alcohol, (vino sublimato): "Ita datum radicitùs expurgat per superiora et inferiora." I should think it would.

§ GEOFFROY—*Tractatus de materia medica*, 1741; I cite the French translation of A. BERGIER, T. I, Paris, 1743, p. 519.

‖ C. ALSTON—Vol. I, Lect. XX, Sect. 2, p. 128, *op. cit.*, p. 772, *supra:* "I was, when about eighteen, persuaded by a lady doctress to take vitrioli cærulei 3ss dissolved in a glass of water, for a vomit; with which, as she said, she had done much good to many. A large dose indeed! But as I don't remember to have stood in need of it, and being difficultly moved, I vomited but little, and was rather the worse than better for it. Its taste continued with me several days. Hence it is no poison more than iron; and cannot cause intestinorum exulcerationes, but would rather cure them." This is an excellent example of the *non sequitur*.

tery, combined with opium, in pill form; and, because it often nauseated, endeavored to force the stomach to retain it by the sedative influence of hydrocyanic acid.* This practice speedily found imitators. Pereira not only declared that sulphate of copper often succeeded where vegetable astringents failed, but went so far as to employ it in the chronic diarrhœas of infants in the dose of one-twelfth of a grain.† Raleigh praised it above all other astringents in chronic dysentery, but advised that the dose should not exceed one-sixth of a grain.‡ Joseph Brown also employed it in these cases, but only claimed temporary benefit from its use.§ We find it named as an eligible mineral astringent in chronic dysentery in the works of Canstatt, Morehead, Aitken and others.‖ It was employed for this purpose by several medical officers during our civil war,¶ and I myself used it to some extent, but ultimately abandoned it, because, although I seldom exceeded the eighth of a grain at a dose, and guarded it with opium, it seemed often to aggravate the flux instead of checking it. So, too, Maclean states that he uses it with a sparing hand, and only under the pressure of necessity, although he has not defined the necessity to which he refers.**

Wood taught that sulphate of copper proves useful in the chronic fluxes less in consequence of its astringency than because of a supposed stimulant and alterative influence upon the ulcerated surfaces, similar to that it exerts upon old, indolent ulcers when applied externally.†† The same opinion appears to have been entertained by Fox, who states that he has found it, combined with opium and quinia, especially useful in those chronic diarrhœas in which from the symptoms he believed intestinal ulceration to exist.‡‡

But we possess no evidence to show the correctness of this speculation, and it seems highly improbable that in the doses ordinarily given the copper salt reaches the ulcerated surface in sufficient quantity to act in this way. It is much more probable that the more minute doses owe whatever power they seem to exercise in restraining the bowels to the opium with which they are combined; and doses of the sixth of a grain or more, repeated several times daily, should be regarded with suspicion. They will often be found to produce nausea, vomiting or other gastric disturbances, and to aggravate the flux instead of restraining it. It is well known that in large doses the sulphate, like the other soluble salts of copper, is a violent irritant poison. The continuous use of food contaminated by unclean

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* J. ELLIOTSON—*On the use of the sulphate of copper in chronic diarrhœa*, Med.-Chirurgical Transactions, Vol. XIII, Part 2, 1827, p. 452—thus relates the circumstances under which he first used this medicine, in the year 1824: "Mr. Henry South, one of the pupils, mentioned to me that two cases of the successful exhibition of sulphate of copper and opium in diarrhœa, had recently been related in the Physical Society of Guy's Hospital, and I instantly resolved to profit by his information, and prescribed half a grain of the sulphate of copper twice a-day, with two grains of opium." In this paper he stated that he had used this combination successfully in St. Thomas's hospital for two years and a half, and that "the dose usually borne and required varies from a grain and a half to three grains," which "may be taken for an indefinite time without any fear of constitutional ill effects." He admitted that "it certainly has a tendency to produce vomiting and griping," and therefore gave it in pill form, combined with opium. But even this did not always succeed, for we find him subsequently—*Lectures on the theory and practice of medicine*, The London Medical Gazette, Vol. XII, 1833, p. 557—directing that one to four drops of hydrocyanic acid should be given with each dose, if the opium and copper produce sickness of the stomach. Here, too, in his eagerness to show that no constitutional injury is done by the long continued use of the drug, we find the statement, "I have known a patient take it for three years, for a peculiar kind of diarrhœa, without any such result;" which does not say much for the efficacy of the remedy. See also his account of a case of chronic dysentery successfully treated with sulphate of copper and opium in an earlier number of the same journal—*St. Thomas's hospital. Clinical lecture*, Vol. VIII. 1831, p. 379—and, for a summary of his views on this subject—p. 1063, *op. cit.*, p. 267, *supra*. It will be observed that he still insists upon the use of hydrocyanic acid to quiet the stomach.

† PEREIRA—Vol. I, p. 759, *op. cit.*, p. 746, *supra*. Sulphate of copper has also been praised in the diarrhœa of teething infants by D. M. EISENMANN—*De l'emploi du sulfate de cuivre opiacé comme traitement de la diarrhée occasionnée par la dentition*, Bull. Gén. de Thér., T. LVI, 1859, p. 561.

‡ RALEIGH—p. 112 *et seq.*, *op. cit.*, p. 712, *supra*. § J. BROWN—Vol. I, p. 727, *op. cit.*, p. 715, *supra*.

‖ CANSTATT—Bd. I, S. 526, *op. cit.*, p. 717, *supra*; MOREHEAD—p. 304, *op. cit.*, p. 657, *supra*; AITKEN—Vol. II, p. 659, *op. cit.*, p. 647, *supra*.

¶ See, for example, in Section II, the reports of DE BRULER—p. 42, *supra*; HOLSTON—p. 66; WALTON—p. 88; COOPER—p. 93; and WELCH—p. 96. J. B. BURNET—*Case of chronic dysentery*, The Med. and Surg. Reporter, Vol. XVII, 1867, p. 95—reports a case of chronic dysentery contracted during the war, which was treated in Bellevue hospital, among other remedies, with sulphate of copper and opium, and states that this was the remedy found most efficacious in such cases during his residence in that hospital.

** MACLEAN—Vol. I, p. 124, *op. cit.*, p. 657, *supra*. †† G. B. WOOD—*A Treatise on Therapeutics*, 2d Ed., Phila., 1860, Vol. I, p. 415.

‡‡ T. FOX—*On the curability of chronic diarrhœa*, The Med. Archives, (St. Louis,) Vol. IV, 1870, p. 134: "When there is ulceration of the bowels, as indicated by the retracted abdominal parietes, tenderness on pressure, the presence of black blood in the stools, the contracted, dry, and fissured tongue, and pinched, hard, anxious expression of countenance, the sulphate of copper in small doses, combined with quinine and opium, serves a better purpose, as a continuous treatment, than any formulæ which I have used"—p. 136.

copper vessels gives rise to dangerous and sometimes fatal gastro-enteritis.* It is doubtful whether such doses of the sulphate as were recommended by Elliotson can long be given with greater impunity; whether they do not more frequently injure than benefit.†

The *sulphate of zinc*, employed as an emetic in dysentery by Angelus Sala, and used in combination with alum in the same disease by Moseley,‡ has also been administered in small doses combined with opium in the treatment of chronic fluxes.§ Almost equally as objectionable as copper, there is still less evidence that it is really useful.

The *oxide of zinc* has been more extensively used, particularly in chronic fluxes. James Adair, in a letter which Duncan published in 1785, reported its beneficial effects in a form of cachectic diarrhœa he had observed among the negroes of Antigua.‖ Hendy,¶ in a work published in 1784, mentioned the success with which he had administered it to obstinate cases of habitual diarrhœa while residing in the Barbadoes colony. This use of the oxide of zinc was mentioned with approval by Copland, but Stillé, who referred to it in 1860, prudently remarked that the instances of its alleged efficiency were too few to inspire any confidence in its use.** Penrose prescribed it with supposed advantage at Satterlee hospital during the civil war; he gave it in ten-grain doses along with an equal quantity of powdered nutmeg, and erroneously supposed the remedy to be a novel one.†† Within the last ten years the advocates of this medicament have become more numerous.

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* For an account of the symptoms of poisoning from large doses of sulphate of copper, the reader is referred to the works on toxicology. The accidents resulting to healthy individuals from the contamination of the food with copper derived from unclean copper cooking utensils have been well described by T. MOORE—*Obs. on acute inflammation of the stomach and bowels, produced by the intermixture of verdigris with the food*, The Lancet, 1846, Vol. I, p. 412—who traced to this cause a disease, "which, in its symptoms, course, and termination, presented many of the characteristic features of acute idiopathic dysentery," that broke out among some coolies returning from British Guiana to Calcutta. Post-mortem examination in the fatal cases disclosed severe inflammatory lesions in the stomach and intestines.

† CLARUS—S. 779, *op. cit.*, p. 766, *supra*—testifies that while minute doses of the copper salts disturb the digestion, they appear to produce no essential effect upon the intestine, but that in larger doses they produce greenish, and in still larger bloody, diarrhœa. According to NOTHNAGEL—S. 291, *op. cit.*, p. 746, *supra*—doses of .2 to .3 grammes (three to four and a half grains) almost always produce vomiting, sometimes also diarrhœa, when given to healthy individuals. BUCHHEIM—S. 291, *op. cit.*, p. 746, *supra*—speaking of the use of medicinal doses of sulphate of copper in chronic fluxes, says they do not appear to possess any advantage over numerous other drugs, and adds that larger doses readily provoke diarrhœa.

‡ ANGELUS SALA—*Ternarius Bezoardicorum*, Cap. X, (Leyden, 1616;) I cite Opera Medico-Chymica, Frankfort, 1647, p. 569. He gave from one to two scruples with syrup of quinces and betony water, flavored with cinnamon: compare RIVERIUS—*loc. cit.*, p. 689, *supra*. MOSELEY—see p. 770, *supra*.

§ The use of sulphate of zinc as an astringent in chronic fluxes is mentioned by CLARUS—S. 772, *op. cit.*, p. 766, *supra;* NOTHNAGEL—S. 286, *op. cit.*, p. 746, *supra;* H. C. WOOD—p. 41, *op. cit.*, p. 675, *supra*, and others. NOTHNAGEL remarks: "Dass es beim Darmcatarrh adstringirend wirken könne, ist richtig, indess besitzen wir zu diesem Zweck andere Mittel, die energischer sind, ohne die gleichzeitigen Nachtheile des Zinkvitriol zu haben."

‖ J. ADAIR—*loc. cit.*, note †, p. 770, *supra*—used the native calamine: "*Lapis Calaminaris*. From five grains to one scruple for a dose, with one or other of the adjuncts mentioned under the preceding article, is a powerful astringent in the diarrhœa cachectica:" the adjuncts mentioned are spermaceti, gum Arabic and opium. In the previous paragraph it is explained that the author bestowed the term diarrhœa cachectica upon a diarrhœa which prevailed among the negroes of Antigua the year before. There is no date to this letter, and the volume of DUNCAN'S *Commentaries*, in which it is published, refers to the years 1783–84. I note that H. PUYGAUTHIER—*De l'emploi de l'oxyde de zinc dans le traitement de la diarrhée*, Paris Thesis, No. 250, 1874, p. 6—states that oxide of zinc was first employed in diarrhœa about the year 1781 by ADAIR and J. HENLY, and cites in support of this statement J. F. GMELIN—*Apparatus Medicaminum*, Gottingen, 1795–96, a work which I greatly regret is not in our library. If, however, GMELIN is correctly cited, there is a misprint or mistake in the name of HENLY, the person referred to being unquestionably JAMES HENDY: see next note.

¶ JAMES HENDY—*A treatise on the glandular disease of Barbadoes: proving it to be seated in the lymphatic system*, London, 1784, Part I, Sect. II, p. 86, note: "Flowers of zinc, in my opinion, are a most important article in medicine. I have made trial of them, in a variety of cases, with the greatest advantage to the patient." He specifies epilepsy, hysteria, locked jaw, putrid fevers attended with spasms, intermittent fevers, nervous fevers, &c., and adds: "I have given them, joined with opium, in the habitual diarrhœa, when bark and opium have been ineffectually tried."

** COPLAND—Vol. I, p. 535, *op. cit.*, p. 682, *supra*—in speaking of the use of the mineral astringents, "in several of the forms of diarrhœa, particularly the chronic," wrote: "The sulphate and oxide of zinc are also useful, especially when combined with rhubarb, or myrrh, or the balsams, or terebinthinates," and he cites a formula from DE HAEN for a combination of oxide of zinc with calcined magnesia and powdered columbo as useful for this purpose: see appendix of formulæ, same Vol. STILLÉ—Vol. II, p. 172, *op. cit.*, p. 711, *supra:* "Oxide of zinc is also reported to have cured whooping-cough, spasmodic asthma, intermittent fever, and chronic dysentery, but the instances of its alleged efficacy are too few to inspire any confidence in its use in these affections." This passage also occurs in the first edition of the same work, Philadelphia, 1860, Vol. II, p. 232.

†† PENROSE—p. 45, *supra:* "The remedies which have been most positive in their results, after the acids and opium, have been nutmeg and the oxide of zinc, and the author of this communication claims originality in using them in the disease under consideration." Nothing is easier than to make such claims, nothing harder than to defend them. We have just seen that the use of oxide of zinc in the chronic fluxes dates back to the last century. As for the nutmeg, it was already commended as an aromatic and astringent by AVICENNA, who declared that it eased pain, (confert doloribus,)—so that my friend is not even original in his notion that nutmeg is an anodyne—vide *infra*—and strengthened (confortat) the liver, spleen and stomach—Lib. II, Tract. 2, Cap. 502, p. 362, *op. cit.*, p. 632, *supra*. It figures as an ingredient in a formula recommended by him for the cure of chronic fluxes dependent on ulceration of the bowels—Lib. III, Fen. 16, Tract. 2, Cap. 3, p. 821, *op. cit.* HILDANUS—Cap. X, p. 686, *op. cit.*, p. 644, *supra*—adopted these views, and assigned to nutmeg a high place among the simples by which the bowels may be restrained in dysentery. The only originality in the method of PENROSE must therefore lie in giving the two remedies together, or perhaps in the following fanciful explanation of their *modus operandi:* "The nutmeg was directed as an aromatic and anodyne, conveyed most probably to the ulcerated surface and there producing its beneficial effects. The oxide of zinc was given with the view of having it carried directly to the seat of disease, being perfectly acceptable to the stomach, and if acted on by the acids of the intestines only made more astringent, while its ordinary effects were mild astringency, tonic, and, perhaps, anodyne or sedative effects locally"—*loc. cit*

Curran praised it in chronic fluxes; Brakenridge, Mackey and Tyson in infantile diarrhœa;* while Gubler, and following him Bonamy, claim to have given it with excellent results in ordinary acute diarrhœa as well as in chronic cases.

But even Gubler admits, as an occasional inconvenience, that the drug sometimes disturbs the stomach and provokes vomiting;† and the experience of those who formerly employed it in the treatment of epilepsy shows that considerable doses, long administered, can hardly be regarded as innoxious. They are prone to disturb the digestive functions, to provoke nausea, vomiting, sometimes diarrhœa, and to impair the general health.‡ Similar effects were observed by Werneck from the administration of the drug to healthy persons, and by Michaelis in experiments on animals; the latter found on dissection ulceration of the stomach and bowels.§ The long continued employment of the oxide of zinc in the fluxes must therefore be regarded with distrust.

The employment of *nitrate of silver* in these diseases dates back to Paracelsus, who lauded the virtues of silver in restraining profluvia, as well as in the cure of pains of the head, the spleen and the liver; but he modified the caustic properties of the silver salt by treating it with crude tartar before using it in the fluxes.‖ Angelus Sala, indeed, who, in 1614, published a process for preparing pure nitrate of silver in crystals for medicinal use, declared that it might be given internally in the dose of five to eight grains, that it purged without producing pains in the stomach and belly, cured epilepsy, all sorts of catarrhs and dropsy. But it is doubtful whether this account was drawn by Sala from the use of the pure nitrate or of his *magisterium lunæ dejectorium*,¶‖ in which the acrimony of the silver salt was mitigated by adding nitrate of potash to it and cautiously heating at a tempera-

* J. W. CURRAN—*Oxide of zinc as a therapeutic agent*, The Lancet, 1868, Vol. II, p. 538: "Chronic diarrhœa and dysentery are best and most speedily treated by the oxide of zinc." D. J. BRAKENRIDGE—*On oxide of zinc as a remedy for the diarrhœa of infancy and childhood*, The Med. Times and Gazette, 1873, Vol. I, p. 164; E. MACKEY—*Oxide of zinc in infantile diarrhœa*, The British Med. Jour., 1873, Vol. II, p. 39; TYSON—*loc. cit.*, p. 760, *supra*.

† The success of this drug in the hands of GUBLER is reported by PUYGAUTHIER in the thesis cited note ‖, last page. In illustration of its benefits 14 cases are detailed, observed at the Beaujon hospital. They were chiefly cases of phthisis with consecutive diarrhœa, which appeared to be checked by the oxide given in the dose of 4 grammes, or sometimes 3.50 grammes of oxide of zinc with .50 of bicarbonate of soda; the latter added on account of the nausea and vomiting sometimes produced by the oxide when given alone. See also A. GUBLER—*Commentaires Thérapeutiques du Codex Medicamentarius*, 2me Éd., Paris, 1874, p. 586—who explains that he was led to employ this remedy on account of the high price of subnitrate of bismuth. It may be given in serous and bilious diarrhœas provided it is used in large doses, for he admits that in small doses it may be transformed in the stomach into soluble salts of zinc, which act as emeto-cathartics; but even in large doses he also admits that it sometimes produces vomiting and diarrhœic stools. BONAMY (of Nantes)—*Du traitement des diarrhées rebelles par l'oxyde de zinc*, Bull. Gén. de Thér., T. XCII, 1877, p. 251—reported success from the administration of GUBLER'S combination of oxide of zinc and bicarbonate of soda to a number of cases of obstinate diarrhœa observed during 1876 at l'Hôtel-Dieu de Nantes. The same cases, with some additional ones, are reported by P. JACQUIER—*De l'emploi de l'oxyde de zinc dans la diarrhée*, Paris Thesis, No. 118, 1878—who, however, admits—p. 12—that the drug occasionally produces nausea and vomiting.

‡ Already A. G. RICHTER—*Die Spec. Therapie*, (herausgegeben von G. A. Richter.) 3to Aufl., Bd. VII, Berlin, 1824, S. 695—stated that when oxide of zinc is given to epileptics it frequently produces gastric disorder, and, especially in the case of children, unexpected vomiting. He even went so far as to suggest that it was by producing counter-irritation in the stomach that it relieved the cerebral disease. BUSSE—*Langsame Vergiftung durch Zinkblumen, bei der Kur einer inveterirten Epilepsie*, Wochenschrift für die gesammte Heilkunde, Jahrg. 1837, S. 302—reported the case of a man who took daily, on an average, over 20 grains for epilepsy until he had consumed 3,246 grains. It produced symptoms of chronic poisoning, manifested by marasmus, œdema of the lower extremities, incipient ascites and mental feebleness approaching to idiocy; but there appears to have been constipation in this case instead of diarrhœa; the symptoms disappeared after the withdrawal of the drug. Even T. HERPIN—*Du Pronostic et du Traitement Curatif de L'Épilepsie*, Paris, 1852—who was most enthusiastic as to the good effects of zinc oxide in epilepsy, and who declared: "Qu'il constitue un remède parfaitement innocent, qui peut être donné jusqu'à 6 grammes par jour sans autre inconvénient que des malaises passagers, et qui peut être continué impunément pendant un temps ou quelque sorte illimité"—p. 565—had to admit the frequent occurrence of nausea and the occasional development of vomiting and diarrhœa among those subjected to this treatment—p. 558 *et seq.* In the hands of DELASIAUVE—*Traité de L'Épilepsie*, Paris, 1854—these accidents were found to be more serious, and he often had to suspend the treatment, as much on account of the persistent diarrhœa as of the disgust inspired by it: "Tant à cause d'une diarrhée persistante que du dégoût qu'il inspirait"—p. 375.

§ WERNECK—*Erscheinungen, welche das Zincum oxydatum album oder Flores Zinci bey gesunden Menschen hervorbrachte*, Med.-chirurg. Zeitung, 1831, Bd. III, S. 317—gave zinc oxide to fifteen healthy persons besides himself, and found it to produce gastric uneasiness vomiting, fever, thirst and other disturbances. A. MICHAELIS—*Die physiologischen Wirkungen des Zinkoxyds*, Archiv für physiolog. Heilk., Jahrg. X, 1851, S. 109 *et seq.*

‖ PARACELSUS—*De Præparationibus*, Lib. I, Tract. 5, Vol. II, p. 82, *op. cit.*, p. 336, *supra*. I give his formula for preparing silver for use in the profluvia: "℞. Argenti limaturæ ʒj. Reduc in calcem per aquam Regis. Hujus calcis ℞. ʒij. tartari crudi ʒiij. Reduc ad quartum gradum reverberationis cum extractione Alcali." The aqua regis he then directs to be prepared by distilling nitrum aluminis with vitriol. The product was administered in solution, and said to be especially indicated if the stools were bloody, (Si profluvium rubeum exit, signum est, profluvium cohibitum iri.) I suppose much of the silver nitrate was reduced by heating it with the tartar, and what the strength of the resulting preparation was would be difficult now to say in the absence of more precise details as to the degree of heat employed.

¶ ANGELUS SALA—*Septem planetarum terrestrium spagyrica recensio*, (Amsterdam, 1614,) Opera, p. 194 *et seq.*, Ed. cited p. 776, *supra*—made nitric acid, which he called aqua fortis, in which he dissolved silver purified from copper by means of lead: the solution was evaporated and carefully fused. He called the product *magisterium argenti, crystallum Dianæ, catharticum lunare* or *lapis lunaris*, and gives a process, "de reductione lapidis

ture below the melting point. The once famous *pilulæ lunares* of Boyle consisted of this latter preparation; and Boerhaave, who testified to their purgative efficacy and recommended them in dropsy, expressly forbade the internal use of the pure nitrate of silver.*

Even in this modified form, however, the administration of the silver salt by the mouth had long fallen into disuse, when, in 1794, James Sims directed attention to the employment of the pure nitrate in epilepsy.† It speedily became popular in this disease, but does not appear to have been tried in the fluxes until 1835, when Boudin resorted to it with apparent success, both by the mouth and in enemata, for the diarrhœa of typhoid fever.‡ The report of his observations, published the ensuing year, was speedily followed by an extensive trial of the remedy. It has been recommended in chronic diarrhœas and dysenteries by Macgregor, Copland, Eberle, Trousseau, Graves, Aickin, Waring and others;§ in

lunaris in crystallos ad usum medicinæ," by dissolving in pure water and crystallizing. But he expressly mentions that this magisterium may be so skilfully united with pure nitre that the trick cannot be discovered except by the weight of the product; and in his account of the treatment of dropsy—*Ternarius Bezoardicorum*, Cap. XXI, p. 577, *op. cit.*—mentions the use of no silver salt except the *magisterium argenti dejectorium*, which his commentator, ANDREAS TENTZELIUS—*Exegesis chymiatrica*, same Vol., p. 733—explains was made by dissolving nitre in the silver solution and exposing subsequently with certain precautions to heat.

* R. BOYLE—*The usefulness of natural philosophy*, [1663,] Essay V, Ch. 1; I cite Works, Vol. II, London, 1772, p. 115: "And I shall elsewhere (God permitting) teach you a preparation of silver, whereof about three or four grains being made up (with any proper cooserve) into a little pill, is wont to make a copious evacuation of serum especially (in bodies, that abound with it) without making the patient almost at all sick, or griping him." In the appendix to this treatise—same Vol., p. 204 *et seq.*—he gives the method of preparing these pills by dissolving equal weights of pure crystals of nitrate of silver and nitrate of potash in separate portions of distilled water, then mixing the solutions and evaporating to dryness, then slowly heating, but with great care lest the mixture should melt, till fumes cease to rise, and finally making the resulting white powder into pills with crumb of bread. He declares that these pills are a specific in dropsy, and useful in the *genus nervosum* and the palsy. He does not seem to have known that the preparation originated with ANGELUS SALA, but writes: "I do not pretend to be the inventer; having divers years since, learned it by discoursing with a very ancient and experienced chymist;" whose name, however, he does not give, because, he says, he is engaged in the "practice of physick," and it might injure him pecuniarily to annex his name to the receipt during his lifetime. BOERHAAVE—Vol. II, p. 296, *op. cit.*, p. 706, *supra*—calls this preparation "the silver pill of Boyle or Angelus Sala," and details the method of preparing it much as it is given by BOYLE. He remarks that the product has an extremely bitter taste, but is less caustic than the nitrate: "And if two grains of it be fine ground with six grains of loaf-sugar, in a glass-mortar, then mixed with ten grains of the crumbs of bread, and formed into nine pills, and these be taken by a grown person upon an empty stomach, drinking after them four or six ounces of hot water sweetned with honey, they will purge gently, and bring away a liquid water, that often deceives the patient, as coming away almost without being perceived. It kills worms, and cures many inveterate ulcerous disorders; it relieves in the dropsy, and purges without griping; but it must not be used too freely, nor in too large a dose, for it always proves corrosive and weakening, especially to the stomach; which inconvenience is remedied by the rob of juniper." In his *Libellus de mat. med.*—I cite the English Transl., London, 1741, p. 172—he recommends these pills as a purge in dropsy. I note that STILLÉ—Vol. I, p. 360, *op. cit.*, p. 711, *supra*—writes as though the pilulæ lunares were simply composed of nitrate of silver, yet W. LEWIS—*Materia Medica*, 2d Ed., London, 1768, pp. 85–86—from whom he borrows the story, tells it correctly. BOERHAAVE, indeed, protested against the internal use of the pure nitrate: "If given internally in this form, it is an immediate corrosive poison; and therefore never to be used in this manner"—*loc. cit.* I may add that in a modified form the compound of SALA and BOYLE still lingers in some of the European pharmacopœias under the designation *argentum nitricum mitigatum*, *argentum nitricum cum kali nitrico*, or *lapis infernalis nitratis*. According to H. HAGER—*Pharmacopœæ recentiores*, Breslau, 1869, p. 23—the German and Russian pharmacopœias direct it to be made of one part of crystallized nitrate of silver and two of nitrate of potash well rubbed together, melted in a porcelain vessel and cast into sticks. BUCHHEIM—S. 257, *op. cit.*, p. 746, *supra*—states that this preparation is chiefly employed as a mild caustic in eye diseases.

† JAMES SIMS—*On the internal use of silver in the epilepsy*, (Read Oct. 20, 1794,) Memoirs of the Med. Society of London, Vol. IV, 1795, p. 379—used a solution of nitrate of silver in water to which he "mostly added a few drops of the nitrous acid, to keep it more certainly suspended." He says: "Of this solution I have given so much at a time as has contained from a twentieth to an eighth part of a grain of the nitrat, beginning with the former quantity, and gradually increasing to the latter; beyond which I do not recollect to have gone"—p. 382.

‡ BOUDIN—*De l'emploi du nitrate d'argent dans le traitement des fièvres typhoïdes*, Gaz. Méd. de Paris, année 1836, p. 812. His first trials were made at the military hospital of Marseilles in the fall of 1835. He gave pills containing each half a grain of the crystallized nitrate with some starch or gum tragacanth; he also used injections containing from ⅛ to ¼ grain to the ounce of distilled water. The latter were to be preferred when the diarrhœa was the dominant symptom, the former when the stomach and upper part of the small intestine were supposed to be chiefly diseased; and both pills and injections were to be employed when the gastro-intestinal mucous membrane was supposed to be inflamed throughout its whole extent. The result was a prompt disappearance of the inflammatory symptoms in the great majority of the cases treated, and no evil effects were observed in any of them.

§ J. J. MACGREGOR—*On the internal use of the nitrate of silver in inflammation of the intestines*, The Lancet, 1840–41, Vol. II, p. 937—commended it in ordinary chronic diarrhœa, but especially in the diarrhœa of phthisis: he gave to one patient pills containing each 1 grain of nitrate of silver and ¼ grain of extract of opium with 1½ grains of extract of gentian; "one to be taken after every liquid stool." In two other cases he ordered every three hours a pill containing a grain of nitrate of silver with quarter or half a grain of extract of opium. COPLAND—Vol. I, p. 535, *op. cit.*, p. 682, *supra*—states that he has used the nitrate of silver with advantage in mucous diarrhœa and in chronic fluxes. J. EBERLE—*A Treatise on the Practice of Medicine*, 5th Ed., Philadelphia, 1841, Vol. I, p. 252—says, speaking of the treatment of chronic enteritis: "In some instances, decided advantage has been obtained from the use of nitrate of silver; I have prescribed this article in union with the extract of hyoseyamus with marked benefit. Half a grain of the nitrate, with a grain of the extract, may be given three times daily." TROUSSEAU et PIDOUX—T. I, p. 403, *op. cit.*, p. 716, *supra*—gave to cases of chronic diarrhœa in adults as much as 5 to 10 centigrammes of nitrate of silver daily in pill or solution. TROUSSEAU, in a later work—T. III, p. 112, *op. cit.*, p. 664, *supra*—recommends, in obstinate diarrhœas, pills containing each one centigramme of the nitrate, of which from four to ten should be taken daily for five to ten days. R. J. GRAVES—*Clinical Lectures*, 2d Ed., Dublin, 1848, Vol. II, Lect. 52, p. 228: "Nothing, in my opinion, arrests the colliquative diarrhœa which attends consumption in a more satisfactory manner, than a grain of the nitrate of silver given three or four times a day." T. AICKIN—*On the administration of the nitrate of silver in obstinate forms of diarrhœa and dysentery*, Dublin Med. Press, Vol. XVIII, 1847, p. 193. E. J. WARING—p. 103, *op. cit.*, p. 696, *supra*: "I have employed it extensively in the later stages of acute and in chronic dysentery, in doses never exceeding a grain and a half daily, in combination with Dover's powders; and in almost every instance its administration has been followed by speedy and permanent benefit." Its use in chronic dysentery is mentioned approvingly by AITKEN—Vol. II, p. 659, *op. cit.*, p. 647, *supra*; and among its more recent advocates I may mention G. M. NOBLE—*Treatment of diarrhœa*, Med. and Surg. Reporter, Vol. XXIV, 1871, p. 89—who makes eight pills by mixing 4 grains of silver nitrate with 48 of resin, softened by melting it with lard; he thinks this an excellent remedy in dysentery as well as diarrhœa.

the diarrhœa of infants by Hirsch, Trousseau, Binz and Müller;* in acute dysentery by Hudson, Waring, Meigs and Füner. Trousseau for a time employed in this disease an imitation of the silver pill of Boyle, combining about four-tenths of a grain of the silver salt with an equal quantity of nitre, and repeating the dose till it purged;† but he subsequently was led to abandon this dangerous practice.

At the commencement of our civil war there was considerable diversity of opinion among the medical officers as to the probable usefulness of nitrate of silver in the fluxes. Many were restrained from employing it by the unfavorable opinion of Wood, while others agreed with Stillé, who commended it, in combination with opium, as an excellent remedy in chronic dysentery.‡ It was employed chiefly in chronic cases by a number of surgeons, while others neglected it altogether, or, after trial, abandoned it as useless or injurious.§ These latter observers by no means stand alone in their unfavorable opinion. Both Niemeyer and Heubner have expressed the view that little or no benefit can be expected from the internal use of this salt in dysentery. Morehead gave it in India both to Europeans and natives, but obtained no evidences of its efficacy. Williams saw it administered to a number of cases of chronic dysentery at the German hospital in Philadelphia, but could not recall a single instance in which it produced any decided benefit.‖ Most of the best modern treatises on dysentery are silent with regard to it, or embrace it in the general condemnation they bestow upon almost all mineral astringents in this disease.

Certainly it must be admitted that the testimony adduced in its favor is not of a character to outweigh the grave objections to its use. Not only is it capable, in moderately large doses, of irritating the stomach and bowels,¶ but even small doses, if persisted in for some time, are apt to give rise to chronic silver poisoning, manifested by loss of

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* G. HIRSCH—*Bemerkungen über Diarrhœa ablactatorum, Gastromalacie und den Gebrauch des Höllensteins*, Hufeland's Jour. fortgesetzt von E. Osann, Bd. VII, 1840, St. 4, S. 36—gave it in various forms of obstinate diarrhœa, especially that occurring in recently weaned infants. To these he gave every two hours a teaspooonful of a solution containing, in two ounces of sweetened gum water, quarter of a grain of the nitrate—S. 50. To adults he gave every two hours a pill containing $\frac{1}{20}$ to $\frac{1}{12}$ of a grain—S. 52. TROUSSEAU et PIDOUX—*loc. cit.*, last note—gave it to infants in solution, 1 centigramme dissolved in 40 grammes of sweetened water, one-fourth, one-half or even the whole of the mixture to be taken, "suivant l'effet produit." C. BINZ—*Beobachtungen zur innern Klinik*, Bonn, 1864, S. 148—commends nitrate of silver in the dose of $\frac{1}{8}$ to $\frac{1}{6}$ gr. for the chronic diarrhœa of children: "Ich sah niemals nachtheilige Folgen von dieser Dosis;" yet sometimes he found that it vomited (ausgebrochen) even in the dose of $\frac{1}{10}$ gr. MÜLLER (of Riga)—*Der Durchfall der Kinder mit besonderer Berücksichtigung der Therapie*, Journal für Kinderkrankheiten, Bd. L, 1868, S. 331—reports that he had an experience similar to that of BINZ.

† A. HUDSON—*Obs. on the use of nitrate of silver in some affections of the mucous membranes*, The Dublin Jour. of Med. Sci., Vol. XVII, 1840, p. 234—gave it successfully to a case of acute dysentery in grain doses; he also used it internally in gastralgia. WARING—*loc. cit.*, note §, last page. J. F. MEIGS—*Diseases of Children*, 4th Ed., Philadelphia, 1870, p. 403—employed it in the dysentery of children both by the mouth and rectum; the former mode he found most efficacious. For children two years old he dissolved 1 to 1½ grains in two ounces of sweetened gum water, and gave a teaspoonful every two or three hours. J. FÜNER—*Die Ruhrepidemie in Tobolsk im Jahre* 1863, St. Petersburger Med. Zeitschrift, Bd. VII, 1864, S. 317: "Die innerliche Anwendung dieses Mittels hatte bei weitem mehr Erfolg, als die Anwendung in der Klystierform. Ich verordnete es in Pillenform zu gr. ¼–½, 2 bis 4 Mal im Tage." TROUSSEAU et PIDOUX—*loc. cit.*, note ‖, last page—recommend pills containing, each, 2½ centigrammes of nitrate of silver, the same quantity of nitrate of potash and 5 centigrammes of starch or bread crumb; every half hour one of these is to be taken until they purge: "On donne de demi-heure en demi-heure une pilule semblable jusqu'à ce que le malade commence à être purgé." In his later work—T. III, p. 170, *op. cit.*, p. 664, *supra*—there is no longer any mention of the use of nitrate of silver in acute dysentery except in enemata.

‡ G. B. WOOD—Vol. I, p. 403, *op. cit.*, p. 775, *supra*—though he regarded nitrate of silver as a most effectual remedy in chronic gastritis, declared that he had obtained much less favorable results in chronic enteritis, and expressed the opinion that "it probably seldom enters the small intestines, or at least penetrates far into them, without being decomposed, and thus rendered unable to act on the surface of the bowel in the method above referred to." STILLÉ, in the tract several times referred to—p. 378 *et seq.*, *op. cit.*, p. 650, *supra*—spoke of nitrate of silver and acetate of lead as "the most useful remedies of their class" in chronic dysentery. He advised that they should always be associated with a small proportion of opium.

§ Thus the use of nitrate of silver is favorably spoken of in Section II, *supra*, in the reports of STORROW—p. 43; SCHÄSSLER—p. 44; WRIGHT—p. 62; MUSSEY—p. 82; WALTON—p. 88; and COOPER—p. 93. In the Columbia epidemic of 1868 COUES—p. 61—employed it in acute dysentery. Its employment in chronic cases is also spoken of favorably by BROWER—*Camp diarrhœa*, Transactions of the State Medical Society of Indiana, thirteenth annual session, Indianapolis, 1863, p. 45. I myself spoke favorably of its use in chronic camp diarrhœa on hear-say evidence—p. 258, *op. cit.*, p. 606, *supra*: "Nitrate of silver may be given in pills of $\frac{1}{8}$ to $\frac{1}{4}$ of a grain, every two hours, alone or combined with opium." But I added: "Its use should not be persisted in more than a few weeks, on account of the danger of inducing permanent discoloration of the skin." I do not, however, remember ever to have given it myself. On the other hand, BIGELOW—p. 83, *supra*—reported that he used it without benefit; BROWN—p. 81—that it "acted well in some cases, but cannot be relied upon as a rule;" and PENROSE—p. 45—that although it answered in a few cases, in the majority it proved useless or injurious.

‖ NIEMEYER—*loc. cit.*, p. 767, *supra*. HEUBNER—S. 548, *op. cit.*, p. 529, *supra*. MOREHEAD—p. 307, *op. cit.*, p. 657, *supra*. A. WILLIAMS—*A review of the treatment of the principal diseases at the German hospital, Philadelphia*, Med. and Surg. Reporter, Vol. XXXIII, 1875, p. 48; in these cases it was given in pills containing quarter of a grain each of nitrate of silver and opium, and continued "in most cases, for two weeks or more."

¶ BINZ and MÜLLER—cited note *, *supra*—saw quite moderate doses ($\frac{1}{6}$ grain) sometimes excite vomiting in children, and TROUSSEAU—T. III, p. 112, *op. cit.*, p. 664, *supra*—acknowledged that, given in centigramme doses to cases of chronic diarrhœa, it sometimes augmented the flux.

appetite, impaired nutrition and a bluish discoloration of the skin which disfigures the victim: sometimes this latter accident precedes the other symptoms of chronic poisoning; sometimes albuminuria is developed in consequence of silver deposits in the kidneys.* An unfortunate instance of such silver poisoning was observed by Surgeon B. Woodward in the hospital at Tullahoma, Tennessee, during the year 1863. In this case the discoloration appeared after but four weeks' treatment with silver, which, however, did not benefit the chronic flux for which it was administered; and when the patient died, in a miserably emaciated condition, his bowels were found to be extensively ulcerated.† On the whole, I incline to the opinion that it would be prudent to abandon the use of nitrate of silver in the fluxes, except perhaps in the form of enemata, which will be discussed further on.

Butler Lane, who, in 1846, suggested the substitution of the *oxide of silver* instead of the nitrate for internal use, employed it in cases of diarrhœa following typhoid fever and other fluxes;‡ and Da Costa is reported to have given this preparation in the dose of a quarter of a grain four times daily to a case of chronic dysentery with apparent success.§ That this mode of treatment is really advantageous is, however, as far from proven as it is that it is exempt from the dangers of chronic poisoning if long persisted in.

The internal use of the *acetate of lead* also dates back to Paracelsus.‖ Its frigid properties were believed by the iatro-chemists to be useful in fevers and internal inflamma-

* The more important original investigations as to the physiological action of silver are those of L. KRAHMER—*Das Silber als Arzneimittel betrachtet*, Halle, 1845—which I am sorry to say is not in our library; a brief abstract of its contents, by SCHEER, will be found in Canstatt's Jahresbericht for 1845, Bd. IV, S. 245 *et seq.*; B. BALL (under the direction of Charcot)—*Des phénomènes toxiques déterminés par l'injection directe des sels d'argent dans le torrent circulatoire*, Comptes rendus de la Soc. de Biologie, année 1865, p. 4, and Gaz. Méd. de Paris, année XXXVI, 1865, p. 620; BOGOSLOWSKY—*Ueber die Veränderungen, welche unter dem Einflusse des Silbers im Blute und im Bau der Gewebe erzeugt werden*, Virchow's Archiv, Bd. XLVI, 1869, S. 409; A. MOURIER—*Des effets physiologiques et thérapeutiques des préparations d'argent*, Paris Thesis, No. 197, 1871; and C. ROUGET—*Rech. sur l'action physiologique de l'absorption des sels d'argent*, Archives de Phys. Normale et Path., T. V, 1873, p. 333. Excellent summaries of the most important facts are given by T. and A. HUSEMANN—*Handb. der Toxicologie*, Berlin, 1862, S. 870 *et seq.*; NOTHNAGEL—S. 302, *op. cit.*, p. 746, *supra*; and BUCHHEIM—S. 251 *et seq.*, *op. cit.*, p. 746, *supra*. With regard to the occurrence of silver deposits in the Malpighian tufts of the kidney and consequent albuminuria, see especially BOGOSLOWSKY—*op. cit.*—and MOURIER—*op. cit.*, p. 17. Chronic silver poisoning has been designated *argyrismus chronicus*, or simply *argyria*. According to KRAHMER—*op. cit.*—the blue discoloration is due to the deposit from the blood of an albuminate of the oxide of silver which is discolored by light; but C. FROMMANN—*Ein Fall von Argyria mit Silberabscheidungen im Darm, Leber, Nieren und Milz*, Virchow's Archiv, Bd. XVII, 1859, S. 135—who found the deposit in various internal organs, also pointed out that this cannot be the sole cause of the reduction; the deposit exists in fine microscopical granules, which consist probably of albuminate of silver modified in some undetermined manner; they were not soluble in ammonia or hyposulphite of soda, but readily dissolved in cyanide of potassium. A similar distribution of the silver pigment in various internal organs as well as the skin has been observed by B. RIEMER—*Ein Fall von Argyria*, Archiv der Heilkunde, Jahrg. XVI, 1875, S. 296, and Jahrg. XVII, 1876, S. 330—who holds that most probably the silver salt is reduced in the alimentary canal, and the granules transported thence to the points at which they are deposited by a mechanical process similar to that which occurs in anthracosis pulmonum and after certain cases of tattooing—Jahrg. XVI, S. 304. BUCHHEIM—S. 255, *op. cit.*—thinks it most probable that the granules are composed of metallic silver, but does not accept RIEMER'S theory of mechanical transport. He points out that in those of the reported cases in which the quantity of silver taken, before the discoloration ensued, is known, it exceeded 30 grammes, and recommends that in the medicinal use of the drug more than 15 grammes altogether should never be given to any individual. According to the HUSEMANNS—*loc. cit.*—EICHMANN has reported two cases in which the silver discoloration was removed by alternate baths of potash and soap. L. P. YANDELL, Jr.—*Cyanosis from nitrate of silver removed by iodide of potassium*, The American Practitioner, June, 1872, p. 329—has reported two, in which the patients being treated for syphilis with large doses of iodide of potassium and mercurial vapor baths, the same happy result was obtained. Most of the cases known have, however, remained incurable.

† See Case 815, p. 249, *supra*. ‡ BUTLER LANE—*On the use of the oxide of silver*, The London Med. Gaz., 1846, Vol. II, p. 640 *et seq.*

§ *Pennsylvania hospital. Medical clinic of* J. M. DA COSTA, Med. and Surg. Reporter, Vol. XXVIII, 1873, p. 10.

‖ His method of preparing it will be found in *De præparationibus*, Lib. I, Tract. 5, T. II, p. 183, *op. cit.*, p. 336, *supra*, where it is commended as an excellent medicine for healing wounds and ulcers. In the jargon of the alchemists, lead was Saturn; tin, Jupiter; iron, Mars; copper, Venus; quicksilver, Mercury; silver, the Moon; gold, the Sun. As each metal had its mystic correspondence with a celestial sphere, so each had its correspondence with a particular part of the human body and with certain morbid conditions. Hence, when we read in PARACELSUS—*De elemento terræ philosophiæ*, Lib. III, Tract. 4, Vol. cited p. 276: "Sol enim melancholiam purgare potest, et Mercurius choleram, et Saturnus febres," &c., we are to understand that gold cleanses from black bile, quicksilver from yellow bile and lead from fevers. Lead cured fevers in virtue of its cold temperament, for Saturn is the son of frigidity—*Lib. Meteorum*, Cap. VII, Vol. cited p. 308: "Saturnus enim ipsius frigiditatis filius est." Hence lead was believed by subsequent iatro-chemists not merely to cure fevers, but to restrain the sexual appetite. Thus OSWALD CROLL—*Basilica Chymica*, p. 391, Ed. cited p. 736, *supra*—wrote: "Sua frigiditate hoc Sal Saturni intra corpus sumptum libidinem Venerem reprimit: Qui in cœlibatu vivere constituerunt, et illo uti volent, consultius facient, si regionem saltem externam admixto aliquo oleo inungant." J. BEGUIN—*Tyrocinium Chymicum*, p. 383, Ed. cited p. 731, *supra*—expressed very similar opinions. SCHROEDER is cited by MANGETUS—T. II, p. 593, *op. cit.*, p. 736, *supra*—as observing: "Saccharum et magisterium Saturni interno adhibitum chyli et massæ sanguineæ, lymphæque acidum mirifice compescit, fermenta febrilia extinguit et internis inflammationibus viscerum medetur. Externe arcet libidinem priapo inunctum." Yet SCHROEDER appears doubtful whether, as others believed, the internal use of the lead salts produced this latter effect, for he wrote: "Utrum medicamenta Saturnina totaliter aufferant libidinem et sterilitatem inducant, an secus, disceptatur inter Doctores"—p. 590. But the belief that the external application of lead restrained the sexual appetite is much older than this; I find it in PLINY—*Nat. Hist.*, Lib. XXXIV, Cap. 50, T. IX, p. 4512, Ed. cited p. 771, *supra*: "In medicina per se plumbi usus est cicatrices reprimere: adalligatisque lumborum et renum parti luminis frigidiore natura inhibere impetus Veneris. Visaque in quiete Venerea sponte naturæ erumpentia usque in morbi genus his luminis Calvus orator cohibuisse traditur, viresque corporis studiorum labori custodisse." So, too, in the *Canon* of AVICENNA—Lib. II, Tract. 2, Cap. 12, p. 263, Ed. cited p. 632, *supra*—I read: "Et ligatur lamina super locum renum: et prohibet pollutionem frequentem: et sedat desiderium coitus."

tions;* and its recognized virtues in healing external ulcers early suggested its employment in dysentery. Riverius recommended it for this purpose in ten-grain doses.† Ettmüller, who praised it as a specific in dysentery, employed the same dose, and commended also the famous *tinctura antiphthisica*, a solution of acetate of lead and sulphate of iron, which is described in the Augsburg Pharmacopœia, where it is said that, besides its virtues in curing phthisis and the spitting of blood, it can be usefully employed in the alvine fluxes.‡ Dolæus asserted that it was an admirable remedy in dysentery. Salmon wrote, near the close of the seventeenth century, that acetate of lead had the reputation of being good for diarrhœas, dysenteries and lienterics.§ Indeed, the internal use of lead for these and other diseases became so common, and it was so recklessly administered, that the frequency with which lead colic ensued attracted attention and brought about a reaction.‖

During the eighteenth century the internal use of lead fell into general disrepute. Boerhaave declared that he had not dared to use it, because he had never seen those who did successful, and he knew it to be a deceitful and destructive poison; Geoffroy remarked that it should be reserved for external use only, and Cullen wrote, in 1789, that hardly any practitioner will now think of employing any of the preparations of lead as internal medicines.¶ Nevertheless, even during this period of neglect, the internal use of the acetate of lead always found a few defenders. Hundertmark (1744) insisted that it might be safely and advantageously administered, especially in fevers. White, (1775,) although he yielded to the general clamor so far as to express the opinion that the preparations of lead can never be given internally with propriety, testified that he had known repeated instances in which the continued use of the tinctura Saturnina in phthisis had not only proved innoxious but useful; while Reynolds (1784) boldly advocated both this preparation and the acetate as remedies possessed of singular power in restraining hæmorrhages, declaring that he had frequently employed them with success and safety.**

The essay of Reynolds speedily bore fruit in America. Barton, of Philadelphia, spoke favorably of the use of acetate of lead in uterine and other hæmorrhages, in his lectures on materia medica at the University of Pennsylvania; and Archer, of Maryland, prescribed it in the diarrhœa following acute dysentery during the fall of 1798.. He also used it in other obstinate diarrhœas, and his example was followed, in 1799, by his friend, William

* See, for example, OSWALD CROLL—*loc. cit.*, last note—who enumerates quartan fevers and internal inflammations among the diseases it cures: see also SCHRŒDER, cited last note.

† RIVERIUS—Lib. X, Cap. 6, p. 303, *op. cit.*, p. 680, *supra*. He also commends clysters of rose-water and acetate of lead, (sal Saturni.)

‡ ETTMÜLLER—*De morb. hum. corp. in genere*, Cap. IX, p. 129, *op. cit.*, p. 647, *supra*: "Saccharum seu sal plumb. ad gr. x. est singulare remedium, quod vobis N. B. sit recommendatum. Unde etiam cum hoc sacchar. plumb. præparatur tinctura antiphthisica, quæ est elegans in exulcerationibus internis quibuscunque." This tincture is thus described in the *Pharmacopœia Augustana renovata et aucta*, Augsburg, 1684, p. 307: "Tinctura antiphthisica, ℞. Salis Saturni, Vitrioli Martis artific. ana drachmas duas, Spiritus Vini, Aceti destillati una unciam semis. Misceantur, et per aliquot dies digeratur, liquor rubicundus filtretur. Præter virtutem antiphthisicam et hæmoptoicam, etiam in alvi fluxibus utiliter adhibetur."

§ DOLÆUS—*Encycl. Med. Dog.*, (1684,) Lib. III, Cap. 5, Opera, Vol. I, p. 241, Ed. cited p. 729, *supra*: "Saccharum Saturni egregium est remedium in dysenteria, ut et alumen." W. SALMON—p. 670, *op. cit.*, note *, p. 730, *supra*.

‖ We have on this subject, for example, the testimony of QUINCY—Part II, p. 84, *op. cit.*, p. 734, *supra*—who says, speaking of the tinctura antiphthisica: "But certainly the internal use of all such medicines ought to be rejected, into whose composition the least quantity of sugar of lead enters; whose violent astringency on the kidneys and other glands, has frequently produced irremediable and fatal disorders, even where only very small quantities have been taken." JAMES—*Med. Dict.*, Vol. II, London, 1745, Art. *Colica*—is still more explicit: "And we are assured by practical observations, that medicines, which have lead in their composition, as the tinctura antiphthisica, or the magistery of lead, which quacks frequently use for suppressing a gonorrhœa, leave behind them an invincible costiveness, attended with most tormenting pains."

¶ BOERHAAVE—*Elementa Chemiæ*, Vol. II, p. 289, Transl. cited p. 706, *supra*. GEOFFROY—T. I, (1741,) p. 482, French Transl. cited p. 774, *supra*. CULLEN—Vol. II, p. 28, *op. cit.*, p. 740, *supra*.

** C. F. HUNDERTMARK—*De sacchari saturni usu interno saluturi*, Acta Phys. Med. German., Vol. VII, 1744, Append., p. 95. WM. WHITE—*Obs. on the medical virtues of lead*, Med. and Phil. Comm. by a Society in Edinburgh, Vol. III, Part. I, 1775; I cite the 2d Ed., London, 1784, p. 72. The Tinctura Saturnina was a modification of the old tinctura antiphthisica, see note ‡, *supra*. According to QUINCY—*loc. cit.*, note ‖, *supra*—the London Pharmacopœia directed it to be made by digesting, without heat, two ounces each of sugar of lead and green vitriol in two pints of rectified spirit of wine, and filtering through paper. H. R. REYNOLDS—*A letter to Sir George Baker, Bart., on the successful use of the preparations of lead in some hæmorrhages*, (dated Nov. 15, 1784,) Medical Transactions, published by the College of Physicians in London, Vol. III, 1785, p. 217. He reports the successful treatment of hæmorrhage from the uterus, hæmoptysis and hæmorrhage from the nose.

Harris, of Mifflin county, Pennsylvania.* In the same year Hildenbrand published an essay in which he lauded its efficacy in phthisis, and related that he had himself taken it with impunity for some time in grain doses repeated several times daily.† This was speedily followed by a pretty general revival of the use of the drug in Germany: it was employed by Amelung and others, chiefly, however, in phthisical cases and hæmorrhages; but in 1807 Hegewisch, of Kiel, declared in one of his clinical aphorisms that there is no remedy at all comparable to it in chronic diarrhœas.‡ In 1808 Thomas Ewell, of Washington, published an account of some cases of intestinal and other hæmorrhages in which he had resorted to it with success, and suggested its trial in dysentery.§

Against this suggestion Fournier and Vaidy made an energetic but futile protest;‖ the acetate of lead speedily came into very general use both in acute dysentery and in the chronic fluxes. Among the European physicians who have lauded it in the former disease may be mentioned Jackson, Burke, Baly, Waring, Tostain and Niemeyer;¶ among American physicians, Harlan, Chapman, T. D. Mitchell, Eberle, Howard, Dickson and G. B. Wood.** Several of these writers have also recommended it in chronic dysentery and in chronic or other diarrhœas, for which it has also been commended by Copland, Graves, Golding Bird and Stillé.†† In acute dysentery its use by the majority of practitioners has been limited to the later stages of the disease, when it has been administered in doses of from one to three grains or more, three to six times daily or oftener, and usually in combination with opium. The same combination has been frequently employed in chronic fluxes.

Long popular in America, the acetate of lead was used in both these groups of cases by a number of the medical officers during the civil war. Several of them report that in their hands it was frequently or generally unsuccessful, and an instance of lead colic from

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* J. ARCHER—*On the internal use of saccharum saturni (acetate of lead) in diarrhœa*, The Medical Repository, (New York,) Vol. III, 1800, p. 237—gave three times daily a pill containing two or three grains of the acetate. The paper contains a letter from HARRIS, relating his success in treating the diarrhœa of children with the remedy suggested by ARCHER. He gave ½ of a grain every hour or two hours. ARCHER suggested that the remedy would prove useful in the treatment of dysentery, and remarked: "Dr. Barton, you may recollect, in his learned and ingenious lectures on the Materia Medica, mentioned that it had been made use of by several physicians, in hæmorrhagies, with good effect." He also cites REYNOLDS, to whom BARTON also, in a later publication—BARTON'S Edit. of CULLEN'S *Materia Medica*, Philada., 1812, Vol. II, p. 21—has acknowledged his indebtedness. We have the testimony of N. CHAPMAN—Vol. II, p. 505, 4th Ed., *op. cit.*, p. 738, *supra*—that it was through BARTON'S influence that the use of acetate of lead was popularized in Philadelphia.

† HILDENBRAND—*Kleine Beyträge zur Aetiologie der Lungenschwindsucht; nebst einem Winke zur Heilung dieser Krankheit durch Bleymittel*, Hufeland's Jour., Bd. VIII, St. 4, 1799, S. 3. I append his account of his self-experiment: "Ich habe mich daher entschlossen, an mir selbst einige Versuche mit innerlich genommenen Bleyzucker zu machen. Ich habe—von einem Grane angefangen—drey, vier, fünf und mehrere des Tags durch lange Zeit, ohne die geringsten unangenehmen Folgen—ausser einer stark vermehrten Esslust—genommen"—S. 24.

‡ AMELUNG—*Einige Bemerk. und Beob. über die innerliche Anwendung des Bleizuckers vorzüglich bei Geschwüren der Lungen*, same Jour., Bd. XXII, St. I, 1805, S. 1: see also KARL F. BURDACH—*System der Arzneimittellehre*, Leipsic, 1807, Bd. I, S. 328 *et seq.* HEGEWISCH—*Klinische Aphorismen, Zweite Dekade*, Horn's Archiv, Bd. VI, Heft 2, 1807, S. 215: "In den hartnäckigsten chronischen Bauchflüssen—aber ich spreche im Superlativ—ist kein andres Heilmittel, als Bley." That he meant the acetate, is clear from the comments of RICHTER—Bd. IV, S. 125, *op. cit.*, p. 777, *supra*.

§ THOMAS EWELL, (of Washington, D. C.)—*Account of the internal exhibition of the acetate of lead in several diseases*, The Medical Repository, (New York,) Vol. XI, 1808, p. 249. His conclusions were made known in Europe by a brief paragraph in the Med. and Phys. Jour., Vol. XXII, 1809, p. 350, and appear to have attracted much attention.

‖ FOURNIER et VAIDY—p. 384, *op. cit.*, p. 362, *supra*: "Cette proposition, qui décèle une ignorance complette des propriétés délétères de ce poison, est une vision si absurde, qu' elle ne nous paraît pas mériter une réfutation."

¶ R. JACKSON—pp. 441 and 455, *op. cit.*, p. 770, *supra*. ULIC BURKE—*On the good effects of a mixture of acetate of lead and tincture of opium, in the dysentery which occurred in Dublin in* 1825; *with a short description of that epidemic*, The Ediuburgh Med. and Surg. Jour., Vol. XXVI, 1826, p. 56. BALY—p. 537, *op. cit.*, p. 535, *supra*. WARING—*Therapeutics*, p. 496, Ed. cited p. 696, *supra*. TOSTAIN—*Rech. thér. sur l'acétate de plomb, son efficacité dans les diarrhées, la dyssenterie, le cholèra, etc.*, L'Abeille Méd., T. XI, 1854, p. 281 *et seq.* NIEMEYER—Bd. II, S. 756, *op. cit.*, p. 645, *supra*.

** R. HARLAN—*Cases illustrative of the good effects of sugar of lead in dysentery*, The American Medical Recorder, (Philadelphia,) Vol. V, 1822, p. 655. I note that the Editors, JOHN EBERLE and H. W. DUCACHET, protested against his views, remarking: "We have given it in four or five cases, and in one of these its effects were unequivocally injurious;" but EBERLE outlived his objection—see *loc. cit.*, *infra*. CHAPMAN—Vol. II, p. 507, 4th Ed., *op. cit.*, p. 738, *supra*. T. D. MITCHELL, (of Frankford, Penna.)—*Practical hints on the use of the acetate of lead, in dysentery, cholera infantum, &c.*, The North American Med. and Surg. Jour., (Philadelphia,) Vol. I, 1826, p. 70. JOHN EBERLE—Vol. I, p. 244, *op. cit.*, p. 778, *supra*; also 1st Ed., 1830, Vol. I, p. 216. C. C. HOWARD—*Remarks on dysentery*, Southern Med. and Surg. Jour., Vol. XI, 1855, p. 78. S. H. DICKSON—*Elements of Medicine*, Philadelphia, 1855, p. 533—advised it to be combined with ipecacuanha and opium. G. B. WOOD—Vol. I, p. 722, *op. cit.*, p. 671, *supra*. He, however, carefully limited it to the later stages of the disease, "after sufficient depletion and a thorough evacuation of the bowels," to hæmorrhagic cases and to chronic dysentery.

†† COPLAND—Vol. I, p. 535, *op. cit.*, p. 682, *supra*—recommended it especially in the diarrhœa of phthisis; R. J. GRAVES—Vol. I, p. 132, *op. cit.*, p. 778, *supra*—in the diarrhœa accompanied with tympanites, observed in typhoid fever; GOLDING BIRD—see Report of *Meeting of Med. Society of London, Feb.* 9, 1846, The Lancet, 1846, Vol. I, p. 277—in diarrhœa following fever; A. STILLÉ—*loc. cit.*, p. 779, *supra*—in chronic dysentery.

its rash employment was reported by Medical Inspector Wm. H. Mussey;* but as a rule it does not appear to have been pushed to this extreme. It has continued since the war to enjoy the confidence of certain American practitioners, and we occasionally hear its innocence maintained in extravagant language.†

Nevertheless, from time to time voices of warning have been heard. The danger of the production of lead colic from excessive doses has been insisted upon by cautious physicians from the very first. Bampfield accused it of doing harm by producing constipation and subsequent increase of the morbid secretions;‡ Morehead declared that the trials he made with it failed to inspire him with confidence, and regarded its use in chronic dysentery as generally inexpedient, because in such cases it is important to improve the general state of the constitution, a result which is not to be looked for from a salt of lead;§ Savignac and Barrallier exclude it from the treatment of dysentery along with all other mineral astringents except the salts of iron; Maclean and Heubner have both formally expressed their want of confidence in its usefulness.‖

It may aid in deciding between these conflicting views if we recall what is known of the physiological action of the preparations of lead. That any of the soluble salts of this metal in excessive doses may irritate or inflame the gastro-intestinal mucous membrane is well established;¶ but it is probable that the ordinary medicinal doses of the acetate are quite innocent in this respect, and that so far as the danger of giving rise to local injurious effects is concerned it is safer than any of the mineral astringents hitherto discussed. Indeed, a consideration of its operation upon external inflammations would suggest that in moderate doses its influence upon the inflamed intestine may be beneficial.

Not so, however, with the constitutional effects of the drug. The facts with regard to chronic lead poisoning are too well known to be overlooked.** The quantity capable of

* See, for example, in Section II, *supra*, the reports of SCHÜSSLER—p. 44; BELLOWS—p. 70; HOUGH—p. 75; WAINWRIGHT—p. 78; BRETZ and SCHEETZ—p. 80; PECK and GRIMES—p. 86; WALTON—p. 88; and GAGE—p. 93. I myself—p. 229, *op. cit.*, p. 606, *supra*—spoke favorably, in 1863, of the use of the drug in the advanced stages of dysentery; but I added, "care should be taken not to push the remedy too far, or symptoms of lead poisoning will be induced. After from fifty grains to a drachm have been administered, the remedy should always be discontinued." See also J. T. CALHOUN—*Rough notes of an Army Surgeon's experience, during the great rebellion, No.* 19, Med. and Surg. Reporter, Vol. X, 1863, p. 68—who recommends that the treatment of "camp diarrhœa" should be begun with a cathartic, followed by acetate of lead, sulphate of copper or nitrate of silver combined with opium. His favorite combination, however, was persulphate of iron with quinine and opium. H. N. FISHER—*loc. cit.*, p. 697, *supra*—reports that a combination, known as "Gouley's Pill," consisting of one grain each of opium and ipecacuanha and two of acetate of lead, was employed at the Eckington hospital with good results in some cases, but that it failed in others: this was the combination preferred by DICKSON—*loc. cit.*, note **, last page. For more adverse views, see the testimony of HOLSTON—p. 66, *supra;* W. W. BROWN—p. 81; and the report of MUSSEY—p. 79.

† Thus J. L. LUDLOW—*Medical clinic. Chronic diarrhœa*, Med. and Surg. Reporter, Vol. XIV, 1866, p. 307—is reported to have said at the Philadelphia hospital: "Many patients object to the continued use of lead for fear of producing lead poisoning; but in this house we have used bushels of it, and never saw any evil results." Among the recent American advocates of the use of this salt in the fluxes is H. C. WOOD—p. 38, *op. cit.*, p. 675, *supra:* "Its chief use at present is in *diarrhœa*. On account of its sedative properties, when the purging is attended with inflammation, it is the most serviceable of all the astringents; and, owing to the promptness of its action, it is also very valuable in cases with profuse serous discharges. In *dysentery* it is very useful whenever the discharges have become copious. The dose is from two to five grains, always in pill, repeated *pro re nata*."

‡ BAMPFIELD—p. 198, *op. cit.*, p. 682, *supra*.

§ MOREHEAD—p. 306, *op. cit.*, p. 657, *supra*. More than this, after condemning the use of the salt in the earlier stages of acute dysentery—a practice he affirms to have been too common in India—he writes: "It is difficult to understand how a system of treatment which evinces both ignorance of the therapeutic action of acetate of lead and of the pathology of acute dysentery can have originated."

‖ SAVIGNAC and BARRALLIER—see the passages cited in note *, p. 773, *supra;* MACLEAN—*loc. cit.*, note **, p. 775, *supra;* and HEUBNER—*loc. cit.*, note ‖, p. 779, *supra*.

¶ Thus CLARUS—S. 791, *op. cit.*, p. 766, *supra*—wrote: "Sehr grosse Gaben löslicher Bleipräparate dem Magen zugeführt, bewirken gleich anderen Metallsalzen, sei es durch Reizung der berührten Nerven oder durch unmittelbare chemische Verbindung mit dem Eiweiss der Berührungsflächen, Anätzung, Gastroenteritis mit heftigem Schmerz, Erbrechen, Auftreibung des Leibes, zuweilen Diarrhöe, Dyspnöe und Erscheinungen von Collapsus." Compare NOTHNAGEL—S. 269, *op. cit.*, p. 746, *supra*, and BUCHHEIM—S. 239, *op. cit.*, p. 746, *supra:* see also FALCK—S. 153, *op. cit.*, next note.

** I shall not attempt to sketch the literature of this interesting and important subject. The reader who desires an introduction to it may begin with the elaborate work of L. TANQUEREL DES PLANCHES—*Traité des Maladies de Plomb ou Saturnines*, Paris, 1839—a copy of which has been received by our library since note ‖, p. 413, *supra*, was stereotyped. Among the numerous more recent works may be mentioned those of C. PH. FALCK—*Die klinisch wichtigen Intoxicationen*, in Virchow's Handb. der spec. Path. u. Ther., Bd. II, Abth. 1, Erlangen, 1855, S. 158 *et seq.*—which contains a good bibliography up to the date of publication; A. GUSSEROW—*Untersuchungen über Bleivergiftung*, Virchow's Archiv, Bd. XXI, 1861, S. 443; E. LANCEREAUX—*Note relative a un cas de paralysie saturnine*, &c., Mémoires de la Soc. de Biologie, T. IV, 1862, p. 75 *et seq.;* A. EULENBURG—*Differentes Verhalten der Muskeln gegen intermittirende und continuirliche Ströme bei Paralysis saturnina*, Deutsches Archiv für klin. Med., Bd. III, 1867, S. 506; E. HITZIG—*Studien über Bleivergiftung*, Berlin, 1868; L. HEUBEL—*Pathogenese und Symptome der chronischen Bleivergiftung*, Berlin, 1871. Excellent summaries of the facts have been given by the HUSEMANNS—S. 914 *et seq.*, *op. cit.*, p. 780, *supra;* B. NAUNYN—*Vergiftungen durch schwere Metalle und ihre Salze*, Ziemssen's Handb., Bd. XV, 1876, S. 255; and BUCHHEIM—*loc. cit.*, note ¶, *supra*. The principal phenomena are anæmia and

producing this effect undoubtedly varies considerably with different individuals and under different circumstances; but there are cases recorded by trustworthy observers in which broken doses, administered until two drachms, a drachm, half a drachm, or even less were taken, have proved sufficient to produce unmistakable and serious toxic symptoms.* Moreover, the extent of the possible mischief resulting from inducing the constitutional impression of the lead salt in individuals already anæmic or cachectic, to the degree so often observed in the advanced stages of acute dysentery or in the chronic fluxes, is not to be measured by the frequency of the development of the more obvious symptoms of lead poisoning, such as colic or paralysis.† Before these symptoms occur the effects of this metal are manifested by the production of digestive disturbances and of a peculiar anæmia which is quite characteristic. A few years since Malassez‡ applied his method of enumeration to this form of anæmia and found that it could readily be recognized by actual count; indeed, in extreme cases the number of red blood corpuscles was diminished one-half. This poorness in globules persisted after the disappearance of the acute toxic accidents which undoubtedly it often precedes.

It appears impossible to believe that the induction even of minor degrees of the lead anæmia can be beneficial to the anæmic victims of acute or chronic alvine fluxes; and nothing but conclusive evidence that the acetate of lead is more beneficial to the local process than any of the more harmless remedies at our disposal would justify its selection for this purpose. This evidence we do not possess: although, as has been shown, a number of respectable practitioners have lauded its efficacy in these diseases, no trustworthy com-

nutritive disturbances, (cachexia saturnina;) a peculiar pale-yellowish or grayish color of the skin, (gilvor saturninus;) a blue discoloration of the gums, (gingiva saturnina,) sometimes also of other parts of the oral mucous membrane, (livor oris saturninus;) a brownish discoloration of the teeth, (dentes saturninæ;) a characteristic taste in the mouth, (gustus saturninus;) a peculiar odor of the body, (fœtor saturninus;) digestive disturbances, (dyspepsia saturnina;) emaciation and debility, (macies et infirmitas saturnina.) Sooner or later during the progress of the case serious local disorders supervene, especially lead colic, (colica saturnina;) pains in the joints, (arthralgia saturnina;) paralysis, (paralysis saturnina;) and various other disorders of the brain and nervous system, (such as tremor saturninus, anæsthesia saturnina, epilepsia saturnina, encephalopathia saturnina, &c.) It is worthy of note that a catarrhal condition of the mucous membrane of the alimentary canal is one of the most frequent accidents observed after death in fatal cases, and that minute examination has demonstrated a deposit of lead, probably in the form of an albuminate, in almost all the tissues and organs of the body. The relation in which the latter fact stands to the toxic symptoms, especially in view of the remittent or intermittent character of some of them, is not so clearly understood as could be wished. As in the case of chronic silver poisoning, chronic kidney disease and albuminuria sometimes supervene. One of the reporters in Section II. SCHÜSSLER—p. 44, *supra*—preferred the acetate of lead to tannin, "from its tendency to increase the secretion of the kidneys, which the tannin rather diminishes." This idea is altogether erroneous. Ordinary medicinal doses of acetate of lead usually exercise no influence on the activity of the secretion of urine in persons whose kidneys are healthy; but we have the testimony of FR. MOSLER und W. METTENHEIMER—*Zur Wirkung der Adstringentien auf die Harnorgane*, Archiv der Heilkunde, Jahrg. IV, 1863, S. 522 *et seq.*—that large doses diminish the urinary secretion, and that this diminution is accompanied by a diminution in the solid constituents, especially of the urea, the chlorides and the sulphates.

* TANQUEREL DES PLANCHES—Vol. I, p. 64 *et seq.*, *op. cit.*, last note—has collected the testimony of a number of writers with regard to the production of lead colic by the internal administration of the acetate of lead, and expressed the opinion that this accident is more common than is generally supposed—p. 70. In one of these cases, reported by TISSOT—*Obs. sur la colique de plomb*, Œuvres, Lausanne, 1788, T. V, p. 164—the patient took five grains of the acetate three times a day for six days, in all 90 grains, with the effect of developing, a few days after, severe lead colic and paralysis of the upper extremities. WM. LAIDLAW—*Remarks on the internal exhibition of the acetate of lead, chiefly with the view of determining to what extent it may be safely administered in the cure of diseases, especially in uterine hæmorrhages; with cases*, The London Med. Repository and Review, Vol. VI, 1828, p. 33 *et seq.*—took himself, while in good health, three times daily a pill containing 3½ grains of acetate of lead; 40 grains were thus taken "without any other perceptible inconvenience having been produced than a metallic taste, and perhaps some tenderness of the gums and constipation;" but ten grains more, taken at once, produced pain in the stomach, nausea and a sense of weakness at the knees. These symptoms were removed by a dose of salts. A month later he resumed the experiment, and took similar doses for eight days, in all 70 grains, when the symptoms became so severe that, "consulting with Dr. Henry Davies, it was agreed, that the severity of the symptoms rendered it advisable to put a termination to the process"—p. 293. He concluded from these experiments that medicinal doses should not be pushed beyond seventy grains in all. He mentions, indeed, a case—p. 294—in which 75 grains were administered without serious symptoms, but admits that this cannot always be done: "Some patients I have found with whom it could not be carried beyond twenty grains, without inducing vertigo, nausea, and in others, even vomiting." TROUSSEAU et PIDOUX—*Traité de Thér. et Mat. Méd.*, T. I, p. 139, Ed. cited p. 716, *supra*—relate that LÉRIDON, of Buzançais, administered to a patient six grains of acetate of lead daily for three days, with the result of developing violent lead colic. L. S. JOYNES—*Case of colica pictonum, from the medical employment of acetate of lead—with remarks*, The Stethoscope, (Virginia,) Vol. I, 1851, p. 664—gave pills of acetate of lead and opium to a man aged 25, suffering with chronic diarrhœa: "The entire quantity taken was 30 grains, in the course of about four days." The diarrhœa was checked without any immediate ill consequence; but a fortnight later violent lead colic set in and continued for eight days. REYNOLDS and HARLEY—*Case of lead colic arising from the medicinal employment of the acetate of lead*, The Lancet, 1863, Vol. II, p. 507—report an instance in which a laboring man, suffering with phthisis and diarrhœa, received two grains of acetate of lead and ½ grain of powdered opium thrice daily until he had taken 108 grains: a blue line on the gums and unmistakable lead colic resulted.

† With regard to the occurrence of paralysis from the effects of the internal administration of acetate of lead in dysentery, see p. 413, *supra*.

‡ L. MALASSEZ—*Rech. sur l'anémie saturnine*, Mémoires de la Soc. de Biologie, 1873, p. 125 *et seq.*—assumes 4,500,000 red globules per cubic millimetre as the normal standard for the healthy man. This he saw fall in extreme cases to 2,600,000, 2,400,000 and even 2,200,000. He states that the globules are increased in size from 7-7.5 thousandths of a millimetre in a healthy individual to 9-9.5 in lead poisoning; but shows by calculation that, owing to the diminished number, both the total volume and total surface of all the globules in a given volume of blood are really diminished.

parative observations exhibiting its superiority have been recorded; and the testimony that condemns it as inefficient or injurious is, to say no more, quite as trustworthy as that which appears to favor it. If, nevertheless, in special cases, particularly in those complicated with hæmorrhage from the bowels, the practitioner ventures to administer this poisonous salt, the total quantity given should be rigidly limited. It is a good rule not to exceed a drachm in any case; but the symptoms will not unfrequently indicate to the careful observer the desirability of suspending the drug before this point is reached.

*Drying remedies.*—Of the various substances of this kind approved by Galen,* the medicinal earths have fallen into almost complete oblivion. Savignac, as late as 1863, speaks of *Armenian bole* as occasionally employed in France, but it has completely disappeared from English and American practice.† The same author praises the *subcarbonate of iron* in the dose of one to two grammes in chronic dysentery;‡ and certainly this preparation is less objectionable than the more astringent salts of iron; yet on the whole it is probably advisable that chalybeates should only be employed in the fluxes for their specific action on the blood, and in no greater dose than is sufficient to effect that end.

Most of the great variety of *calcareous preparations* employed by Galen§ have also disappeared from modern practice. These preparations may be divided into two groups, the first consisting chiefly of the phosphate, the second the carbonate of lime. The calcined hartshorn and other calcined horns and bones of the Greek physicians are represented in modern English and American practice only by the precipitated *phosphate of lime*,‖ and this is rarely employed in the treatment of the fluxes. Savignac, however, used it in chronic diarrhœa and dysentery, and employed also calcined and pulverized bones under the same circumstances as the carbonate of lime, and without preference for either.¶ Of the preparations consisting essentially of the *carbonate of lime*, prepared chalk and prepared oyster-shell are still retained in the United States Pharmacopœia, as well as the precipitated carbonate, which fully represents their medicinal properties.**

The credulity of the middle ages endowed some of the substances belonging to this group with diaphoretic virtues; but this belief died out during the last century.†† The supposition that they act as absorbents, their dry, porous substance imbibing the foul juices of the diseased intestine, the acrimony of which is thus mitigated, has survived longer, but appears to have no sure foundation. Van Swieten held that the irritating acrimony in the bowels was acid in some cases, alkaline in others; in the first instance cretaceous preparations were beneficial, in the latter injurious.‡‡ Pringle, in his earlier practice, sometimes

* See p. 762, *supra*.

† SAVIGNAC—p. 404, *op. cit.*, p. 620, *supra*—remarks that Armenian bole is essentially a silicate of alumina mingled with oxide of iron, and approves its administration in the dose of 10 to 20 grammes. I note that it is still officinal in the French *Codex* of 1866, p. 100, and that GUIBLER, in his *Commentaries*—p. 457, *op. cit.*, p. 777, *supra*—as late as 1874 approved its employment in chronic dysentery, mucous diarrhœa, &c., with the additional remark that "les Bols de Blois ou de Paris ont une composition semblable et servent aux mêmes usages."

‡ SAVIGNAC—p. 409, *op. cit.*—remarks: "Le sous-carbonate de fer, ou safran de mars apéritif, est l'un de nos meilleurs ferrugineux corroborants, et, de plus, il tonifie localement l'intestin et tend à réprimer les flux diarrhéiques." He especially favors the composition of 10 grammes of bismuth with 1 of the subcarbonate of iron and .05 of opium, declaring that this is one of the formulæ he has employed most frequently and with the greatest success in chronic dysentery.

§ See p. 762, *supra*.

‖ The *calcii phosphas præcipitata* of the U. S. Pharmacopœia of 1870; the *calcis phosphas* of the British Pharmacopœia of 1867.

¶ SAVIGNAC—p. 408, *op. cit.* French pharmacy is very conservative. In the *Codex* of 1866 we still find deers' horns, *cornes de cerf*—p. 49—and burnt bones, *os calcinés*—p. 111—as well as the prepared phosphate of lime, *phosphate de chaux*—p. 215.

** Under the titles *creta præparata*, *testa præparata* and *calcii carbonas præcipitata*. The French *Codex* of 1866 also retains coral, *corail rouge*—p. 49—and the so-called crabs' eyes, *yeux d'écrevisse*—p. 51.

†† This belief was still firmly held in the seventeenth century. Thus, for example, SYLVIUS—Lib. II. Cap. 11, p. 107, *op. cit.*, p. 730, *supra*—in enumerating the sudorific remedies, remarks: "Idem dicendum de ocnlis cancri, coralliis, margaritis, conchis, et similibus, quæ acido peccante usurpata non semel sudorem movent." In the 3d edition of DALE'S *Pharmacologia*, London, 1737, p. 365, we still read of oyster-shells: "Testæ vim habent exsiccandi, sudorem movendi, abstergendi, &c."

‡‡ VAN SWIETEN—§ 722. Vol. II. p. 389, *op. cit.*, p. 663, *supra*.

prescribed a chalk julep in dysentery, but found it to disagree so much oftener than other astringents that he ceased to use it. Subsequently he brought it again into use, but only in diarrhœa or those cases of dysentery in which there was marked gastric acidity.*

Of late years the employment of cretaceous preparations in the fluxes has been limited by many prudent practitioners to those cases in which evidences of acidity in the primæ viæ are recognized, and in these they are prescribed chiefly with a view to their antacid effect.† That they are frequently useful in such cases is probably true; nor is it improbable that in the later stages of intestinal catarrhs they may serve to diminish the excessive secretion of the intestinal mucous membrane, and to some extent therefore deserve their old reputation as drying remedies. But their action is, after all, not very energetic, and probably few practitioners will share the great confidence with which Savignac speaks of their effects in the treatment of chronic fluxes.‡ As ordinarily administered, they are combined with opium and vegetable astringents to the extent of quite masking their feebler action; and the rarity with which they are prescribed alone may serve to indicate the slight confidence reposed in their restraining virtues by the average practitioner.§

Equally safe, but far more efficacious than any of these venerable remedies, is the *subnitrate of bismuth*. Unknown to the ancients,‖ this metal had been isolated, and was already designated by its present name by the German miners before the middle of the fifteenth century. It is mentioned in the writings of Basil Valentine and Paracelsus,¶ and Agricola, who described it about the year 1529, has left us a detailed account of the method by which it was separated.** The metallurgists of the first half of the sixteenth century for the most part regarded lead, bismuth, tin and antimony as constituting a nearly

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* PRINGLE—p. 288, 1st Ed., *op. cit.*, p. 693, *supra:* "At first I used the chalk julep, but being soon sensible of its bad effects, both in the beginning and low state of the disease, I left it off; tho' I could not then so well account for its disagreeing oftner with the sick than other astringents: but having since found by experiments, that both the chalk and the testacea are of a septic nature, it seems reasonable to reject them here." In the experiments referred to—Appendix, Paper 3, Exp. 23, same Vol., p. 390—he exposed ox gall and water, or flesh and water, to gentle heat, with and without prepared crabs' eyes, prepared chalk, &c., and found that with the addition of these substances putrefaction took place more speedily than without them. In his 7th edition he speaks of giving the chalk julep "when the patient complained of a heart-burn, and of everything turning sour on his stomach"—p. 272—and "for correcting that strong acid so incident to relaxed stomachs"—p. 284; also in diarrhœa—p. 207, note.

† See STILLÉ—Vol. I, p. 346, *op. cit.*, p. 711, *supra;* NOTHNAGEL—S. 198, *op. cit.*, p. 746, *supra;* H. C. WOOD—p. 569, *op. cit.*, p. 675, *supra.*

‡ SAVIGNAC—p. 408, *op. cit.*, p. 620, *supra:* "J'accorde une grande confiance aux préparations calciques insolubles dans le traitement des dysentéries et des diarrhées chroniques."

§ The *mistura cretæ* of the U. S. Pharmacopœia consists simply of prepared chalk rubbed up with gum Arabic and water, with the addition of some glycerine and cinnamon. As actually administered, some laudanum or paregoric, with the tincture of kino or catechu, is almost always added.

‖ We have the testimony of OLAUS WORM—*loc. cit.*, next page—that it has been supposed to have been one of the varieties of plumbum described by PLINY: see *Nat. Hist.*, Lib. XXXIV, Cap. 47–50, Vol. IX, p. 4507 *et seq.* According to that author there are two genera of lead, the black and the white, (nigrum atque candidum.) The former is our lead; the latter, called cassiteron by the Greeks, (κασσίτερος by HOMER,) is our tin. Of ordinary lead (plumbum nigrum) there were three varieties, known as Ovetanum, Caprariense, Olcastrense, but these titles appear to have served merely to indicate the places in which favorite mines existed: see Editor's note—*loc. cit.* AVICENNA—Lib. II, Tract. 2, Cap. 12, p. 262, Ed. cited p. 632, *supra*—mentions two varieties of plumbum nigrum, Alannoch and Alahabar. He attributes to them indifferently cold and moist properties, and regarded them as useful in healing wounds, ulcers, &c.: see note ‖, p 780, *supra.* That one of these varieties was really antimony, as is suggested by FALLOPIUS—*loc. cit.*, next page—is a conjecture unsupported by anything in the account of the Arabian writer.

¶ In the *Handwörterbuch der reinen und angewandten Chemie* of H. v. FEHLING—Bd. IX, Brunswick, 1864, S. 710—I read: "Basilius Valentinus im 15 Jahrhundert spricht zuerst von Wismuth als einem Metall." Our library possesses none of the works of BASIL VALENTINE except that cited on p. 689, *supra*, so that I have been unable to verify this statement, which, however, I do not doubt. PARACELSUS threw around the subject the halo of his wonderful imagination. For him—*Philosophiæ de generationibus elementorum*, Lib. IV, Tract. 3, T. II, p. 280 *et seq.*, Ed. cited p. 336, *supra*—the metals were all compounds of different properties of salt, sulphur and mercury, and in nature coexisted with marcasitæ and cachimiæ. Both of these were superfluities, consisting of the same elementary substances that form the metals, but ejected by the Archeus of the metals during their generation, and the resulting compounds varied in properties according as salt, sulphur or mercury predominated. Zinc and bismuth—Cap. 10, p. 282—were a like sort of superfluity, capable of being extracted from marcasitæ. They were generated from the residuum after the separation of other metals; they were themselves both metals and not metals; zinc was the spurious offspring of copper, and bismuth of tin. Elsewhere he classes marcasitæ as a variety of cachimiæ—*De mineralibus*, p. 350, same Vol.—for we read: "Nomina cachimiarum. Marcasitæ, pyrites, antimonia, cobalta, talka, auripigmenta, sulphura, arsenicalia. Tot mihi nota sunt." And we learn in both places that there are two kinds of marcasitæ, the yellow and the white. For more on the subject of marcasitæ, bismuth and zinc, see *Archidox.*, Lib. II et III, same Vol., p. 8 *et seq.* I may add that in this edition zinc is always written *zinctum* or *zinctus*, but I do not doubt that the English translator of the *Archidoxes*, &c., London, 1661, p. 21, correctly renders it *zinck.*

** T. THOMSON—*System of Chemistry*, 3d Ed., Edinburgh, 1807, Vol. I, p. 292—says that AGRICOLA described it in his treatise called *Bermannus*, written at least as early as 1529; and L. GMELIN—*Handbook of Chemistry*, Vol. IV, English Transl., London, 1850, p. 427—says that it was "recognized as a distinct metal by Agricola in 1529." The treatise of G. AGRICOLA—*Bermannus, sive, de re metallica dialogus*—was printed at Basel in 1530; I have not been able to see it, but in the Italian version of his *De re metallica Libri XII*, Basel, 1563, Lib. IX, p. 375, there is an account of the method of separating this metal, which he names plumbum cinereum, (piombo cinericcio in the version I cite.) Like the other processes in the work, this is illustrated by a rude but striking engraving.

allied group, as being in fact so many genera of plumbum. This view was expounded by Falloppius, Cardanus (1550) and Aldrovandus,* but I do not understand them to have in any way confounded bismuth with the other metals. The question was a purely speculative one, relating merely to the classification of bodies which resembled each other in certain particulars, and Falloppius expressly affirmed that bismuth differed in its nature from both tin and lead. But whatever interpretation may be put upon the language of these writers, it is at least certain that Olaus Worm (1655) described bismuth as a peculiar metal, quite distinct from lead or the others of the group, so that it is an error to credit Stahl with having been the first to take this view.†

The chemists of the sixteenth and seventeenth centuries learned to make a magistery of bismuth by precipitation, and flowers of bismuth by sublimation;‡ and some of them ventured to give these preparations, especially the flowers, internally, supposing them to

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* GABRIEL FALLOPTIUS, (died, 1562,) in Cap. 22 of his treatise *De metallis seu fossilibus*—published posthumously, Venice, 1564, T. I, p. 383, edition cited p. 706, *supra*—treated at some length on the nature of bismuth. He cites the passage of PLINY, referred to in note ‖, last page, and explains that the plumbum nigrum of the ancients is common lead, and was so called because it blackened the hands; their plumbum album is our tin, (stannum,) but their stannum was either an alloy of silver and lead, obtained on the first flowing from the furnace from argentiferous lead ore, or it was an alloy artificially prepared and of various composition. PLINY makes three species of plumbum nigrum, but rather on account of the places of origin than any difference in nature. AVICENNA makes two species, but I [FALLOPTIUS] know only one, and suspect AVICENNA confounded antimony by the second: (Verum non nisi unum genus nigri plumbi novi ego; et Avicenna per alterum genus intelligat de stibio, nescio quid dicam.) To these two the moderns have added a third kind, which in certain places in Germany is called *bisce*, and is named by others plumbum cinereum vel cinerulentum, on account of its lustre. But this differs in its nature from the nature of lead and tin, (ejus tamen natura differt a natura plumbi nigri et plumbi albi,) it is friable and can be reduced to a powder not only by a pestle and mortar but by the fingers. Melted with tin it makes it harder; hence it is called "marchasita librariorum, vel impressorum," because those who engrave letters on statues and vases mix it with the tin to make it retain the characters longer. Moreover, this mixture is used by the Venetians who manufacture tin vessels, which are made more shining as well as harder, although they do not wear so well as those made of tin alone. HIERONYMUS CARDANUS—*De subtilitate*, (1550,) Lib. VI of the Opera, Lyons, 1663, T. III, p. 457—stated briefly that there are four species of lead: p. nigrum, the common lead; p. album, commonly called tin, (stannum;) bismuth, only recently discovered, a sort of intermediate between lead and tin, (bisemutum hucusque incognitum, quasi medium inter nigrum et album,) and even in our own age not generally known, since it is found only in the mountains of Bohemia; the fourth species is antimony, (stibium.) ULYSSES ALDROVANDUS, (died, 1605, in his posthumous work—*Musæum Metallicum*, Bologna, 1648, Lib. I, Cap. 7, pp. 160–61—apparently borrows most of his account of this subject from the two writers just cited. After discussing p. nigrum, p. album and stibium, he remarks: "Nuperi authores, et potissimum Cardanus speciebus enumeratis quartam, nempe plumbum cinereum addunt, in Germania vocatum bisemutum, quod inter nigrum, et album medium quodammodo locum occupat; juxta vulgatum carmen. *Candidius nigro, sed plumbo nigrius albo.*" He refers to the title marchasita librariorum mentioned by FALLOPTIUS, and remarks that he has learned from the metallurgists that antimony is the substance used to give hardness to type-metal.

† OLAUS WORM (died, 1654)—*Museum Wormianum*, published by his son, Amsterdam, 1655, Lib. I, Sect. 3, Cap. 8, p. 125—made a separate group of bismuth, antimony and mercury, which he calls peculiar metals, or metals improperly so called, (De sui generis, seu improprie dictis metallis) because although they have a great affinity to the true metals, they differ in being neither ductile or malleable, but instead are frangible, friable or fluid. He calls it plumbum cinereum, and says it owes this name to AGRICOLA. The metallurgists call it bismuthum: CÆSALPINUS called it marcasita argentea, (I suppose in his work, *De Metallicis*, Rome, 1596, which I have been unable to see;) the Germans call it *Wismut*, *Mythin* and *Conterfeit*. Some have supposed it to be the plumbum argentarium of PLINY, others think it was unknown to the ancients. As to its nature he pointedly remarked: "Potius sui generis metallum esse puto, quam ut ad plumbum referatur. Differt namque ab utroque plumbi colore et duritie." He adds a description of the ore from which it is obtained, which, he says, occurs in the silver mines of England and Saxony, (Anglia et Misnia.) It is often added as an alloy to tin to give it hardness and lustre, as well as to make it melt more readily. Vessels are thus produced which emulate silver in appearance. So far as he knew it had no use in medicine, except that BEGUIN relates how to prepare a cosmetic (*fucus*) from it for whitening the skin. G. E. STAHL—*Obs. chymico-physico-medicarum curiosarum, mensis sextus, December*, Frankfurt, 1697, Cap. 2, p. 321, *De plumbo antimonii, pauca*—earnestly enough declares that those metallurgists, metallicolæ, who include lead, tin, bismuth, (or marcasita fusibs) the regulus of antimony and still more lately zinc, under the single rubric "plumbum," are rather empirics than physico-chemists. This paper is republished in his *Opusculum Chymico-Physico-Medicum*, Halle, 1715, p. 489. In the same volume is his *Diss. poeterior metallurgiæ pyrotechnicæ*, in which—Cap. 3, pp. 790–91—he classes bismuth, zinc and antimony as metaliform minerals. As our library does not contain the rest of the chemical works of STAHL, I know not what more he may have written on this subject, but as he was not born until five years after the posthumous work of OLAUS WORM was published, it is absurd to attribute to him the credit of having first recognized that bismuth should not be confounded with tin and lead, as has been done by STILLÉ—Vol. I, p. 184, *op. cit.*, p. 711, *supra*—who writes, on whose authority he does not tell: "Bismuth was confounded by the ancients with tin and lead, and was first distinguished from them by Stahl." I must add that I do not at all suppose that I have found references to all the earlier accounts of bismuth, and especially I regret that I have not been able to consult the essay of J. H. POTT—*Observationes de Wismutho*, in his *Obs. et Animad. Chym. Collectio*, T. I, Berlin, 1739—which is said by THOMSON—*loc. cit.*, note **, last page—to embrace "every thing respecting it contained in the writings of the alchymists." Nor have I been able to see a copy of the work of G. REILINGS—*Collectanea curiosa de bismutho*, Leipsic, 1718—which is also said to be rich in alchemical details.

‡ Already PARACELSUS in his *Archidoxes*, Lib. VI, p. 23—Vol. cited note ‖ p. 780, *supra*—writes concerning the preparation of magisteries from the various kinds of marcasite, specifying, among others, the bismuthic (bisemutica) marcasita. And here I must say a word with regard to the meaning of the term marcasite, (spelled variously marcasita, marcassita, marchastin, &c.) It appears to have been originally bestowed by the German miners on various composite, not very rich ores, but not indiscriminately on all, and to have been used with a somewhat different significance by different writers, and even by the same writer at different times. Compare the definitions of MANGETUS—T. II, p. 210, *op. cit.*, p. 736, *supra*—and JAMES—*Med. Dict.*, Vol. II, London, 1745—word *Marcasita*. The marcasita pallida was an ore that yielded zinc, and marcasita argentea yielded bismuth. Later writers sometimes used the word marcasite as an equivalent for bismuth: *e. g.*, SCHRÖDER, cited by DALE (1693)—p. 31, Ed. cited p. 729, *supra*—which was not the original usage. According to DALE—*loc. cit.*—bismuth was also sometimes called tin-glass. I will not take space to detail the various processes applied to bismuth, or the ore from which it was derived, by the chemists of the sixteenth and seventeenth centuries. In the work of MANGETUS—T. I, p. 418—a formula is given from ROLFINCIUS for the formation of a magistery of bismuth by the precipitation of a solution of the metal in nitric acid with salt of tartar, and one—same Vol., p. 932—for the preparation of flores bismuthi by subliming together calcined marcasite and sal armoniac. The method of preparing the magistery given by QUINCY—Part II, p. 111, *op. cit.*, p. 734, *supra*—is to precipitate a solution of bismuth in nitric acid with a solution of common salt in water; he directs the flowers to be prepared by subliming powdered bismuth with nitre.

possess diaphoretic virtues similar to those attributed to mineral bezoar.* The magistery of bismuth, our subnitrate, found more extensive use as a cosmetic, and the fashionable women of the seventeenth century enhanced the whiteness of their charms with this adhesive powder as those of our own age still do.† But the leading therapeutists of that century and the next denounced the internal use of these preparations in such unmeasured terms that they were never generally employed in this way, and had become quite obsolete,‡ when Odier of Geneva, in 1786, drew attention to the beneficial effects of the internal administration of the magistery of bismuth in certain forms of gastralgia, and thus brought about its introduction into modern therapeutics.§

It is unnecessary here to trace the history of its employment in gastric affections: references to a few of the more important papers are subjoined in a foot note.‖ It appears to have been first employed in the treatment of the fluxes by Leo, of Warsaw, who used it in 1831, during the prevalence of Asiatic cholera, in the dose of two or three grains every two or three hours, and claimed for it greater virtues in the cure of this disease than subsequent experience has shown it to possess.¶ In 1833 Trousseau published a paper** in

* I suppose the internal use of the bismuth preparations is unquestionably as old as PARACELSUS—*De præparationibus, Lib. I*, Vol. II, p. 75. *op. cit.*, p. 336, *supra*—who lauds both the mareasita aurea and m. argentea as possessed of special virtues in restraining hæmorrhages. They should be mixed with pitch and colophon and reduced to a calx, which was to be given internally to those who spat blood. QUINCY—*loc. cit.*—remarks of the flowers of bismuth: "But if the nitre and the arsenical salts are washed away by frequent solutions in warm water, it will not only continue to be a good cosmetic, but may also with safety be given internally; and by some is reckoned a good diaphoretic. Yet as the materia medica is large enough in its supply for that intention; there is no occasion to torture a poison to make a medicine of it. Its dose and virtue, in the manner directed, are the same as of the bezoar mineral"—*i. e.*, butter of antimony dropped into three times its weight of nitric acid, dried and calcined—Part II, p. 110, same Vol. GEOFFROY—T. I, p. 417, *op. cit.*, p. 774, *supra*—states that some prepare flowers of bismuth, which they assert to be diaphoretic, but that most persons dread the internal use of this mineral on account of the arsenical parts contained in it. POTT—*op. cit.*, note †, last page—must have been one of those who experimented with its internal use, for MÉRAT and DE LENS—*Dict. Universel de Mat. Méd.*, T. I, Paris, 1829, p. 605—state that he reported a case in which vomiting, colic, anxiety and vertigo followed its ingestion.

† Thus BEGUIN—*Tyrocinium Chymicum*, Lib. II, Cap. 11, p. 271, Ed. cited p. 731, *supra*—describes, under the head of calcinatio marchasitæ argenti, a process for making magistery of bismuth by precipitation, and adds, "usus ejus est ad cutis vitia." SCHRŒDER is cited by DALE—*loc. cit.*—as saying, "usus rarissimus est, et non nisi externus;" to which DALE adds, "nonnulli ex eo fucum elaborant ad cutim dealbandam." QUINCY—*loc. cit.*—says of the flowers of bismuth: "These are very white, and used as an excellent fucus, mixed with pomatum, or rose-water: but they must not be too busy with it, who try it upon their complexions; for the saline part of the arsenic may do mischief many ways."

‡ Besides SCHRŒDER, QUINCY and GEOFFROY, I may cite ALSTON—Vol. I, p. 332, *op. cit.*, p. 772, *supra:* "Bismuth is commonly reckoned an arsenical substance, and as such safe neither inwardly nor outwardly, being worse than lead. But perhaps without sufficient reason; it seeming to partake more of the nature of antimony, than of either of these, or of tin. However it is very little used, if it be not, as a cosmetic, reduced to flores, or a magisterium." LEWIS—p. 142, *op. cit.*, p. 778, *supra*—writes that the flowers and magistery of this metal "have been recommended externally against gleeting sores, and internally as diaphoretics similar to the milder antimonial medicines. In the first intention, they appear to be greatly inferiour to some of the saturnine preparations: in the latter, it is not certain what their real effects are, or even whether they are safe. At present, they are employed only as a fucus, nor is this use of them entirely innocent; for they gradually impair the natural complexion, and, as the college of Strasburg observes, occasion a thickness and defedation of the skin." CULLEN, in his *Materia Medica—op. cit.*, p. 740, *supra*—did not deign to mention bismuth.

§ L. ODIER—*Sur les effets du magistère de bismuth, donné intérieurement comme antispasmodique*, Jour. de Méd. Chir. Pharm., &c., T. LXVIII, 1786, p. 49—gave it at first in fractions of a grain, but soon growing bolder gave 2–3 grains or more at a dose. He writes that perhaps he may give larger doses after more experience, but as yet has never gone beyond 12 grains four times a day. While lauding its beneficial effects, he admitted that in a small number of cases the patients on first taking it experienced vomiting, diarrhœa or constipation, vertigo, &c.

‖ BAUME—*Obs. sur les vertus du magistère de bismuth sur trois sujets attaqués d'une douleur chronique de l'estomac*, same Jour., T. LXXIV, 1788, p. 69. B. CARMINATI—*Hygiene, Therapeutice et Materia Medica*, Vol. II, Pars I, Pavia, 1792, p. 439—where he cites a former work on the subject, "*Opuscula Therapeutica*, Pavia, 1788, Vol. I, Opus 2," which I have not seen. A. MARCET—*Obs. on the medical use of the white oxyd of bismuth*, Memoirs of the Medical Society of London, Vol. VI, 1805, p. 155. This physician learned of the remedy from ODIER himself, and though he calls it white oxide meant, as he explains, the magistery of bismuth, "prepared by dissolving a quantity of very pure bismuth in nitric acid, and precipitating it by water, or by a solution of potash." S. A. BARDSLEY—*Medical Reports*, London, 1807, p. 218, *On the medical effects of the white oxyd of bismuth*. S. W. MOORE, New York—*An Inaug. Diss. on the medical virtues of the white oxide of bismuth*, 1810; I cite from a review in The Eclectic Repertory, (Philadelphia,) Vol. I, 1811, p. 234. Both this writer and BARDSLEY use the term white oxide in the same sense that MARCET did.

¶ L. LEO—*Ideen u. Erfahr. über die Natur und Behandl. der asiat. Brechruhr, mit besonderer Bezichung auf die Anwendung des Wismuths gegen dieselbe*. Warsaw, 1832. I have not been able to see this work, but learn from a letter of LEO, dated June 11, 1831, which HUFELAND published in his Journal—Bd. LXXII, 1831, St. 5, S. 138—that he gave the magistery of bismuth, in the dose mentioned in the text, with a little sugar. But from the very first his sanguine views failed to be sustained by the experience of others. LEWESTAN—same Jour., Bd. LXXIII, 1831, St. 2, S. 116—reported the same year that of 24 cholera patients treated in this manner at Dantzig, 18 died. TROUSSEAU—T. IV, p. 263, *op. cit.*, next note—found it inefficacious except in the stage of choleraic diarrhœa; in the acute period of algid cholera he regarded it as, to say the least, useless. MONNERET—T. XLVII, 1854, p. 268 *et seq.*, *op. cit.*, next page—who so stoutly advocated the use of bismuth in very large doses in the fluxes, and who found it exceedingly useful in choleriue and other forms of epidemic diarrhœa, honestly confessed, "que le sous-nitrate de bismuth, si utile dans les diarrhées et les cholérines actuellement régnantes, échoue complétement dans le choléra bien caractérisé."

** A. TROUSSEAU—*De l'emploi du sous-nitrate de bismuth dans le traitement de la diarrhée*, Bull. Gén. de Thér., T. IV, 1833, p. 261—found it useful in acute diarrhœa; he gave it twice daily, 12 to 18 grains, in pill or powder. In acute gastro-enteritis with colic and vomiting, as well as diarrhœa, and in sporadic or epidemic dysentery, it should not be given till the violence of the acute symptoms is subdued by other medication; but its usefulness is greatest in chronic diarrhœa, in which he gave 18 to 36 grains daily with immense advantage, (avantages immenses.) He was not very successful in the diarrhœa of phthisis, but more so in colliquative diarrhœa proceeding from other causes. See also TROUSSEAU et PIDOUX—T. II, p. 752, *op. cit.*, p. 716, *supra*, and TROUSSEAU—T. III, p. 113, *op. cit.*, p. 664, *supra*.

which he commended its efficacy in the dose of twelve to thirty-six grains daily for acute and chronic diarrhœa. But it was especially Monneret, whose enthusiastic praise of the action of this preparation in the fluxes brought it into extensive use in their treatment, and whose boldness in administering it served to demonstrate that it is quite innoxious. In an essay, published in 1850, he lauded its effects in the acute and chronic diarrhœas of children and adults, and even in acute dysentery. In the diarrhœas of adults he gave it in the dose of ten grammes daily for the first few days, and then, if the disease continued, gradually increased the dose to fifty or even to seventy grammes; in acute dysentery he gave as much as sixty to seventy grammes a day with decided benefit. In subsequent papers he reported continued success, and ridiculed the ignorance of those who imagined the drug to be possessed of poisonous properties.*

After the publication of the observations of Trousseau and Monneret the use of bismuth in the fluxes rapidly became popular, especially in France. It was given with advantage in the acute and chronic diarrhœas of both children and adults,† in the diarrhœa of typhoid fever and of phthisis.‡ Some have even gone so far as to rely upon it as the most important therapeutic agent in acute dysentery. This was done by Monneret in sporadic cases; by Pellieux in an epidemic that occurred in the vicinity of Beaugency in 1852; by Maillot the following year in the dysentery of Algeria; and in the dysentery of Guadeloupe during 1860 and 1861 by Brassac, who also employed it with success in chronic fluxes.§

During our civil war the subnitrate of bismuth was employed to some extent, especially in diarrhœa and chronic dysentery; but it was by no means so generally tried as would have been desirable. Acting Assistant Surgeon John B. Trask used it successfully at Camp Downey, California, in the fall of 1861, in the treatment of an epidemic outbreak of diarrhœa: in many of these cases he gave it in combination with calomel. Encouraged by his success he employed it uncombined during August and September, 1862, at Finley hospital, Washington, in the diarrhœas, chiefly chronic, which prevailed among the wounded brought from the Army of the Potomac, as well as in other cases. The quantity administered varied from forty-five to eighty grains daily, usually given in a single dose. An account of these observations, published in April, 1863, drew attention to the subject, and

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* MONNERET—*Du sous-nitrate de bismuth à hautes doses*, Bull. Gén. de Thér., T. XXXVIII, 1850, p. 433; also, *De l'emploi du sous-azotate de bismuth à haute dose, dans le traitement de diverses maladies*, same Jour., T. XLVII, 1854, pp. 113, 209 and 265—in which he remarks: "Les toxicologues et les auteurs de traités de thérapeutique, qui écrivent sans observer, ont construit un roman qui ne laisse pas encore que d'en imposer aux véritables praticiens, trop modestes, cependant, pour oser douter de ce qui est écrit dans les livres qu'on appelle plaisamment classiques"—p. 113. See also *Du mode d'administration du sous-nitrate de bismuth et de son emploi thérapeutique*—same Jour., T. LXXI, 1866, p. 481—where he explains more fully his views with regard to the mode in which the remedy acts.

† In the diarrhœa of children it has been employed by TROUSSEAU and MONNERET; HUBER—*Einige Bemerkungen über die Behandlung der Kinderdurchfälle*, Deutsches Archiv für klin. Med., Bd. VI, 1869, S. 107; J. SENSEMAN—*The uses of subnitrate of bismuth*, Med. and Surg. Reporter, Vol. XXIV, 1871, p. 131, and many others. In the diarrhœa of adults by SCHINA, of Turin—see an article in the Bull. Gén. de Thér., T. XLV, 1853, p. 274, *Un mot sur l'emploi du sous-nitrate de bismuth dans la diarrhée;* N. GUÉNEAU DE MUSSY—*Leçons cliniques sur la diarrhée chronique*, Gaz. des Hôpitaux, 1872, p. 114—who, however, does not wish to give more than 6 to 12 grammes a day to adults; and by many others.

‡ In the diarrhœa of typhoid fever by BRIQUET and ARAN—see an article in the Bull. Gén. de Thér., T. XL, 1851, p. 317, *Emploi du sous-nitrate de bismuth à haute dose pour arrêter les diarrhées qui succèdent à la fièvre typhoïde.* In the diarrhœa of phthisis, especially by MONNERET, and THEOPHILUS THOMPSON—*On the utility of trisnitrate of bismuth in the diarrhœa accompanying phthisis*, Med.-Chirurg. Trans., Vol. XXXI, 1848, p. 305. TROUSSEAU was not so successful with it in such diarrhœas—see note **, last page.

§ MONNERET—*loc. cit.*, note *, *supra*. PELLIEUX—see an article in Bull. Gén. de Thér., T. XLII, 1852, p. 428, *Nouveaux faits à l'appui de l'emploi du sous-nitrate de bismuth à haute dose dans le traitement de la dyssenterie.* He is said to have given 8 to 30 grammes a day to adults; 4 to 13 to children: the results surpassed his hopes. MAILLOT—see an article in the Bull. Gén. de Thér., T. LXXV, 1868, p. 560, *De l'emploi du sous-nitrate de bismuth à haute dose dans le traitement des affections dysentériques en Algérie*—introduced this practice in 1853. It was attended with such success that the annual consumption increased until in 1868 the supply forwarded from Marseilles for the military hospitals in Algeria was 460 kilogrammes. I may add that I find by the *Statistique Médicale de l'armée pendant l'année* 1868, Paris, 1870, p. 61, that the strength of the army in Algeria that year was 55,773 present, and the hospital admissions for diarrhœa numbered 1,805, with 30 deaths; for dysentery, 1,625, with 72 deaths—p. 201—which does not include the more trifling cases treated in quarters. BRASSAC—*Du sous-nitrate de bismuth*, Archives de Méd. Navale, T. V, 1866, p. 161 *et seq.*—treated 14 cases of acute dysentery with subnitrate of bismuth in large doses in 1860; all recovered; four of these cases had been treated with ipecacuanha and calomel before entering hospital. Of 10 chronic cases, 7 were cured and 3 improved—p. 286. His subsequent experience with the remedy continued to be favorable, both in acute and chronic dysentery and in diarrhœa, the only drawback being the difficulty of getting a sufficient supply to enable him to use it after the method of MONNERET.

led to the trial of the remedy by others, especially in the hospitals of Washington and Alexandria.* Some of the medical officers who used it obtained excellent results, but this was by no means universally the case.† That it was not more generally successful was due in part to the circumstance that it was very often given in insufficient quantity, or combined with other drugs which impaired its efficiency, but doubtless chiefly because too much was expected of it, and because it was given indiscriminately without regard to the character of the intestinal lesion or the constitutional condition of the patients.

In endeavoring to form an opinion of the place of this remedy in the treatment of the fluxes, its mode of operation must be taken into consideration. When properly prepared, and entirely free from arsenic or other injurious foreign admixture, it is an almost wholly insoluble powder, and the only benefit to be expected from it is its local action upon the mucous membranes with which it is brought in contact.‡ Headland insists that this local action is purely mechanical, while Fonssagrives invokes for it also a local sedative influence. If the prompt manner in which it acts when dusted upon raw or inflamed surfaces of skin or mucous membrane, as in intertrigo, coryza or vulvitis, be compared with the more tardy and less efficient action of other insoluble powders in similar conditions, we shall be inclined to accept the latter suggestion.§ The investigations of Bergeret and Mayençon seem to prove that it is so acted upon in the alimentary canal that minute quantities are absorbed; but we are entirely without evidence to show that this circumstance is either beneficial or injurious.‖ Nearly the whole of any dose administered is evacuated by the stools, a part

* John B. Trask—*Report on the treatment of acute and chronic diarrhœa, with sub-nitrate of bismuth, at Camp Downey, Cal., and Finley Hospital, Washington, D. C.*, San Francisco, 1863. This pamphlet is in the form of a report to Surgeon R. H. Coolidge, U. S. A., Medical Director of the Department of California, and is dated April, 1863. From the account given—p. 7 *et seq.*—the epidemic at Camp Downey appears to have been one of those outbreaks of catarrhal diarrhœa which were so common among the newly levied volunteers—see p. 286, *supra*. The strength of the command was 500 men, the number of cases of diarrhœa 94. Of these 20 were treated with bismuth alone, and 58 with bismuth combined with calomel. The bismuth was given in the dose of 10 to 50 grains; the calomel, 3 to 10 grains; all the patients recovered. At Finley hospital the number of cases treated was 270, of whom 182 were wounded men who had diarrhœa besides their wounds. In all these cases the disease was "promptly and radically" arrested.

† See the report of Surgeon T. Rush Spencer—p. 50, *supra;* also the reports of Schüssler—p. 44; Schell—p. 70; Bretz—p. 80; and Tuttle—p. 90. Wooster—p. 100—reports that he obtained good results with a combination of bismuth and blue mass, neither proving adequate alone. Welch—p. 96—reports the successful use of the subcarbonate. See also the reports of my own experience, and what I had learned verbally from others—p. 258, *op. cit.*, p. 606, *supra*—and p. 126 of *Circular No. 6*, cited p. 571, *supra*. On the other hand, Kempster—*op. cit.*, p. 493, *supra*—reported that the subnitrate of bismuth in two-scruple doses failed so often in the chronic diarrhœas he observed during the war that he abandoned its use.

‡ This was the view of Monneret—see T. XLVII, 1854, p. 118 *et seq.*, and T. LXXI, 1866, p. 481, *op. cit.*, note *, last page.

§ F. W. Headland—*On the Action of Medicines*, Amer. reprint of 4th London Ed., Philadelphia, 1868, p. 105—writes: "The nitrate of bismuth"—of course he means our subnitrate—"is a very insoluble salt. It passes down along the mucous surface of the intestine, and is not absorbed. Being insoluble, its action is quite confined to the mucous surface. It may be given safely in very large doses (as 5j, or more,) and it is probable that its anæsthetic action is simply mechanical in nature, and depends upon its affording a soothing sheath to the irritable and painful surface of the stomach. So that it is only by covering this, and not at all by an influence on the stomach nerves, that it operates as a local anæsthetic. In the bowel also it sheathes the surface, and absorbs irritating fluids. It is not a true astringent, and counteracts certain forms of diarrhœa in something the same manner as chalk." Gubler—p. 680, *op. cit.*, p. 777, *supra*—writes: "Mais, à part les effets antispasmodiques qu'on est porté à lui attribuer, on ne lui connaît aucune action manifeste lorsqu'il est parvenu dans la circulation. En qualité de poudre sèche il s'imbibe des liquides. C'est donc tout à la fois un antacide et un absorbant mécanique." Fonssagrives—Art. *Bismuth*, Dict. Encyclop. des Sciences Méd., T. IX, 1868, p. 527: "Un certain nombre de médecins ne voient dans le sous-nitrate de bismuth qu'un moyen mécanique, une sorte de poudre-mastic jouant, par rapport aux muqueuses, un rôle préservateur, ou mitigeant par l'interposition d'une poudre inerte, l'âcreté des liquides gastro-intestinaux. Je crois que, dans beaucoup de cas, il faut faire intervenir cette action, mais pour sa part seulement, et qu'il y a lieu d'invoquer une action *sédative* locale, antispasmodique si l'on veut, exercée par ce médicament sur les filets nerveux avec lesquels il est en contact et de laquelle résulte une diminution dans la sensibilité de la muqueuse gastro-intestinale et dans la motricité des plans musculaires qui la doublent." He further suggests—p. 532—that in diarrhœa it proves useful by absorbing the sulphuretted hydrogen that may be present in the alimentary canal; a circumstance to which W. F. McNutt—*Some of the uses of bismuth*, California Med. Gazette, Vol. I, 1868-69, p. 129—believes its efficacy is almost entirely due. This latter view appears to me to be an exaggerated one. To the efficacy of the local action of subnitrate of bismuth used externally in the conditions mentioned in the text and similar ones, I can bear unequivocal testimony from much personal observation.

‖ Bergeret et Mayençon—*Recherche du bismuth dans les tissus et dans les humeurs*, Jour. de l'Anat. et de la Phys., 9me année, 1873, p. 243—used a test-paper charged with sulphocyanide of potassium: this gives a yellow stain on contact with a soluble salt of bismuth. With this test they were always able to recognize bismuth in the urine of patients a few hours after it had been taken internally. In rabbits to whom they had administered it, they were able to recognize it in all the tissues and organs of the body, even when eight days elapsed after it was given before the animals were killed. In the cadaver of a man who had taken one gramme of the subnitrate a few days before death, they recognized it in the liver and kidneys, but failed to find it in the cadaver of a woman who had taken two grammes of it twelve days before death. They also found it in the fluid of an ovarian cyst in a patient who had taken two grammes a short time before. They conclude that the subnitrate of bismuth is promptly absorbed and infiltrates all the tissues, that it is slowly eliminated, and that it seems to augment the plasticity of the blood. This latter statement appears to rest upon a single observation: The blood of a rabbit which had taken bismuth coagulated very firmly! I may add that Orfila—T. II, p. 13, *op. cit.*, p. 699, *supra*—had previously detected bismuth in the urine, liver, spleen, &c., of dogs poisoned by the soluble protonitrate of bismuth. His paper—*Nouvelles recherches sur plusieurs poisons tirés du règne minéral*, Annales d'Hygiène Publique, T. XXVIII, 1842, p. 219—speaks of the detection of bismuth in animals poisoned by it, but does not detail experiments, and I presume the statement is based simply on his former work with the soluble nitrate.

of it at least in the form of sulphuret, which blackens the discharges. No trustworthy observations can be adduced to show that the internal use of pure subnitrate of bismuth ever influences the circulation, the nervous system or the secretions, except indirectly in consequence of its local action upon the alimentary mucous membrane.

The evidence brought forward during the present century to prove that it may occasionally exert a poisonous influence does not sustain criticism. This evidence consists of experiments upon animals, alleged cases of poisoning, and reports of certain disagreeable effects said to be occasionally observed after medicinal doses. The experiments upon animals most generally cited are those of Orfila and Mayer. The first used the soluble nitrate, the poisonous properties of which may be concealed, in some of his experiments; in others he complicated the result by the fatal operation of ligature of the œsophagus. In the instances he reports, in which the subnitrate introduced into the stomach appeared to act as a corrosive poison, as in the similar observations of Mayer, it is exceedingly probable that the drug was contaminated with arsenic, as has been proved to be the case in certain recent instances of human poisoning; at least no steps were taken to exclude this source of error.*

As for the alleged cases of poisoning which figure in the works on toxicology, I find on investigation that the one attributed to Sobernheim is merely a garbled version of that reported by Kerner; and that in this the reporter, as long ago as 1835, publicly confessed that he had been misled by an ignorant chemist† who examined the remains of the medicine which produced the symptoms, and declared it to be subnitrate of bismuth, whereas it

* ORFILA—T. II, p. 10 *et seq.*, *op. cit.*, last note. MAYER—*Ueber das Wismuth*, &c., Hufeland's Jour., Bd. LXXIII, St. 4, 1831, S. 65. For the fatal effects of ligature of the œsophagus, see the account of the discussion on the subject in the French Academy of Medicine by M. SEE—*Acad. de Med.: ligature de l'œsophage*, &c., Gaz. Hebdomadaire, T. III, 1856, p. 609 *et seq.*, and *Ligature de l'œsophage au point de vue toxicologique*, same Vol., p. 642 *et seq.* The experiments reported in these articles show not merely that death is produced by this operation, but the inflammatory lesions are observed in the stomach, &c., on dissection, although no poison has been taken.

† JUSTINUS KERNER—*Geschichte einer tödtlichen Vergiftung durch basisches salpetersaures Wismuth*, Neue Jahrb. der teutschen Med. und Chirurg., (Heidelberg klin. Annalen.) Bd. XIV, Heft 3, 1829, S. 348. A drunkard, suffering with severe gastric trouble, (sodbrennen,) took about two drachms of what was supposed to be a mixture of magnesia and cream of tartar. Symptoms of corrosive poisoning were developed, and death ensued after nine days' suffering. On dissection, patches of inflammation and gangrene were found in the fauces and throughout the intestinal canal. A quantity of the powder used remaining on hand, a part of it was submitted to chemical analysis and reported to be subnitrate of bismuth, (das basische salpetersaure Wismuth.) This story is repeated by ORFILA—T. II, p. 14, *op. cit., supra;* FONSSAGRIVES—T. IX, p. 538, *op. cit.*, last page; in England by CHRISTISON—*On Poisons*, 1st Amer. from 4th Edinburgh Ed., Philadelphia, 1845, p. 384—who remarks: "The following is the only case with which I am acquainted of poisoning with the preparations of bismuth in the human subject." From CHRISTISON it was copied by PEREIRA—T. I, p. 673, Ed. cited p. 746, *supra*, and I regret to find it also in the work of STILLÉ—Vol. I, p. 186, *op. cit.*, p. 711, *supra*. All these writers have been ignorant of the fact that a few years after his original publication, KERNER—*Eine tödtliche Vergiftung durch weisses Quecksilberpräcipitat. Zur Berichtigung eines Irrthums*, Heidelberg. Med. Annalen, Bd. I, Heft 3, 1835, S. 479—with commendable frankness related that, although at the first he had been satisfied with the accuracy of the chemist who had decided the powder to be bismuth, he took the remains of it, with the written report of the chemist, and submitted them to a control-investigation at the medical college. Circumstances long delayed the examination there, to which no particular importance appears to have been attached. At length a complete and exact analysis was made, which revealed the almost inexcusable error that had been committed, (den allerdings fast unverzeihlichen Irrthum der ersteren,) and demonstrated beyond doubt that the metallic portion of the powder consisted of the white precipitate of mercury, *(Mercur. præcip. albus.)* The writer, therefore, begs leave to correct his former error, and recapitulates his original narrative to make the correction more emphatic. This article is abstracted, under the title *Mercurius præcipitatus albus. Vergiftung*, in J. Frank's Magazin, Bd. III, 1850–51, S. 262; and the matter is correctly stated in the work of the HUSEMANNS—S. 861, *op. cit.*, p. 780, *supra;* but since the correction does not appear to have reached England and America, I have thought proper to draw special attention to it. J. F. SOBERNHEIM—*Handbuch der praktischen Arzneimittellehre*, 4te Aufl., Berlin, 1855, S. 268—after relating KERNER's case as one of bismuth poisoning, without any mention of the subsequent correction of this error relates another in which, after taking two drachms of the subnitrate, fatal symptoms of corrosive poisoning were developed. This second case has been accepted as an independent one by STILLÉ—*loc. cit.;* TAYLOR—*On Poisons*, 3d Ed., London, 1875, p. 487; and others. I believe it, however, to be a mere duplication of KERNER'S case, and for the following reasons: The two narratives are wonderfully alike. In both the poisonous dose was two drachms, and the essential features of the symptoms and post-mortem appearances agree, although, as SOBERNHEIM tells the story, KERNER'S case died on the 15th day; the second case on the 9th, and KERNER'S case was not salivated while the second case was. To this I can only say that the difference of date is a blunder which shows that SOBERNHEIM did not consult the original account of KERNER, who expressly states that his patient took the drug on the 14th of May and died on the 23d, that is, in nine days after taking the poison. As for the salivation, it is true that in his second paper KERNER expressly states that his patient was not salivated: "Eine Spur von Speichelfluss war nie vorhanden"—S. 481, *op. cit., supra;* but when he wrote this he had evidently forgotten that in his original narrative he had stated that the patient, when first seen, complained of a disagreeable taste in the mouth, (beschwerte sich immer über einen widrigen Geschmack im Munde.)—S. 350—which on the 16th is spoken of as metallic, (der widrige metallische Geschmach im Munde war H. sehr lästig:) and that in his account of the symptoms, on the 18th, he had stated that much thick saliva of a brown color and metallic taste was secreted: "Es wurde viel dicker Speichel, der braun aussah und metallisch schmeckte, abgesondert"—S. 353. So that CHRISTISON—*loc. cit., supra*—who borrowed the case from the very fair abstract in Férussac's Bull. des Sci. Méd., T. XX, 1830, p. 188, *Hist. d'un empoisonnement mortel par le sous-nitrate de bismuth; rapportée par le Dr. J. Kerner*, was not inaccurate when he wrote: "On the fourth day swelling and tension of the belly were added to the preexisting symptoms, on the fifth day salivation, on the sixth delirium, on the seventh swelling of the tongue and enormous enlargement of the belly, and on the ninth he expired." It follows from this analysis that SOBERNHEIM'S second case is, like his first, a garbled version of KERNER'S, clipped from some second-hand source. He does not state that he witnessed it himself, and gives no authority for it. Sound criticism cannot do otherwise than reject it as a duplication which indicates little discernment on the part of the toxicologists who have accredited it.

proved on subsequent examination to be really the white precipitate of mercury. It is discreditable to medical literature that these cases continue to be cited as examples of poisoning by bismuth. There remain three cases in which symptoms resembling those of arsenical poisoning followed the use of this remedy, but in which the patients recovered. In that reported by Traill the drug was not chemically analyzed, but in those related by Fullerton and Hebert this precaution was taken, and a sufficient quantity of arsenic found to account for the symptoms.* It must, therefore, be conceded that no trustworthy evidence exists to show that this preparation, when pure, is ever poisonous in any dose.

To the abundant testimony already published with regard to the impunity with which large doses of the pure drug may be given, I may add the results of my own personal experience. I have often taken myself, and administered to others, one- and two-drachm doses, repeated thrice, four times or oftener daily, for several days without the slightest unpleasant consequences, and without any perceptible effect except the arrest of the diarrhœa for which it was taken. As for the minor disagreeable effects said to follow occasionally its medicinal use, such as headache, a sense of gastric vacuity, nausea or even vomiting, they are for the most part phenomena, accidentally coexisting, for which the remedy is not responsible; but may sometimes have resulted, especially in the case of the older observations, from arsenical or other contamination.†

The scorbutic and cachectic symptoms, described by Lussana as having occurred in certain cases of chronic tubercular and other fluxes, variously treated for a considerable period with large doses, I suppose, from a study of his narrative, to have been phenomena of the disease rather than of the drug. No one else has observed anything of the sort, although the practice of administering large doses for weeks consecutively is common enough.‡ De Mussy, in speaking of his success with this remedy in diarrhœa, states that

* T. S. TRAILL—*Outlines of a Course of Lectures on Medical Jurisprudence*, 1st Amer. from the 2d Edinburgh Ed., Philadelphia, 1841, p. 130—relates the following case: "A country apothecary gave a patient of mine twelve drachm doses, instead of a drachm divided into twelve doses; the man took 5j the first day, 5ij on the second, and 5ij on the third day, when I was called, and found him suffering extreme pain in his abdomen and throat. He had vomited on the previous evening; his pulse was small, he felt very feeble, and had much anxiety about the præcordia. I gave castor oil, milk porridge, and carbonate of potassa. The man was several days very poorly, but finally recovered." There was no chemical analysis of the drug in this case, but the symptoms are best explained by supposing a contamination with arsenic, such as was actually found in the two following cases: H. S. FULLERTON, of Hillsborough, Ohio—*Case of poisoning by impure nitrate of bismuth*, Amer. Jour. of the Med. Sci., Vol. LXVII, 1874, p. 280—reports that a physician having taken the subnitrate for medicinal purposes experienced, after a day or two, symptoms of gastro-intestinal irritation, and observed some puffiness about the eyes. Discontinuing the bismuth, these symptoms disappeared, but they recurred when it was resumed. Chemical analysis demonstrated the presence of a formidable proportion of arsenic. Finally, L. HEBERT—Le Mouvement Médical, Nov. 22, 1873; the number of this Journal cited is not in our library, and I borrow the account from a note appended to the last case by the Editor of the Journal—has reported a case in which symptoms of poisoning were developed in an infant taking subnitrate of bismuth, and in which arsenic was recognized in the medicine by chemical analysis.

† See the accounts of gastric uneasiness, &c., occasionally noticed after the administration of medicinal doses by POTT—note *, p. 788, *supra;* ODIER—note §, same page; and others. WERNECK—*Erscheinungen, welche das Bismuthum nitricum oxydatum album seu Subnitras Bismuthi bey gesunden Menschen hervorgebracht hat*, Med.-chirurg. Zeitung, 1831, Bd. III, S. 312 *et seq.*—gave from 6 to 40 grains daily to healthy subjects, and reports that it produced gastric uneasiness, headache, giddiness, circulatory disturbance, sometimes diarrhœa; in very large doses it sometimes excited vomiting, but this effect was quite uncertain. G. GIACOMINI—Vol. VII, p. 171, *op. cit.*, p. 754, *supra*, also p. 478 of the French translation, cited on the same page—states that he himself took daily 10 to 40 centigrammes of the subnitrate of bismuth in pill form before breakfast. The only sensible effect was a sensation of hunger or rather of emptiness of stomach, which was readily calmed by a little food, but which was only temporarily relieved by drinking water or coffee, recurring promptly and with more force to such a degree as to give rise to extreme lassitude; occasionally it appeared to increase the secretion of urine. These descriptions, so far as they represent actual objective observations, must refer to phenomena which either accidentally coexisted, or were produced by arsenical or other contamination of the samples used.

‡ FILIPPO LUSSANA—*Dell'azione del sotto-nitrato di bismuto*, Gaz. Med. Italiana, Lombardia, T. III, 1852, p. 29, (see also Dublin Quart. Jour. of Med. Sci., Vol. XV, 1853, p. 252.)—following the directions of MONNERET, administered the subnitrate of bismuth in large doses to patients affected with tubercular diarrhœa, diarrhœa the consequence of chronic enteritis, gastralgia of long standing and mesenteric disease. He declares that it is true that it did not give rise to intestinal irritation, but states that it did not arrest his cases of tubercular or mesenteric diarrhœa; and I suspect that it was from the progressive cachexia, probably complicated with a scorbutic taint from inadequate nourishment, which accompanied the progress of these unarrested cases, that he drew the group of phenomena he supposed to be due to chronic bismuth poisoning. According to his account, patients who continue long the use of large doses of bismuth acquire a leaden aspect; the eyes become sunken and present a livid subpalpebral circle; the breath becomes offensive; the gums swell, grow livid and discharge a sanious blood; hæmorrhage is easily excited, and sometimes profuse passive hæmorrhages arise. No one else has made similar observations. MONNERET—see note *, p. 789, *supra*—who has used the drug so freely, never saw anything of the sort, nor have any similar phenomena ever been observed by TROUSSEAU or others, who in modern times have done the same. I myself have, in thousands of patients suffering with fluxes during our civil war, who, however, had never taken any bismuth, seen phenomena quite similar to those described by LUSSANA; but I have never seen any similar results ensue upon the long continued use of bismuth either in those to whom I have administered it myself or those to whom I have seen it given by others.

in a few cases it has appeared to increase the diarrhœa instead of diminishing it.* In my own earlier trials I sometimes observed the same thing; nay, as elsewhere reported, during the civil war I witnessed a few cases in which its administration for diarrhœa was followed by tormina, tenesmus and other dysenteric phenomena.† But this effect I have still oftener observed to follow the premature checking of an acute diarrhœa by opium or astringents; and since I have learned to exercise due discretion as to the time when bismuth may be first administered, I have ceased to encounter such accidents.

The sole value then of the reported cases of poisoning, or other injurious effects from the administration of this medicine, is that they emphasize the importance of avoiding the use of carelessly prepared or sophisticated samples. The contamination with arsenic is especially to be dreaded. The chemical analyses of samples offered for sale to the Medical Department of the United States Army during the last few years show that the presence of a trace of this poison is exceedingly common, and that occasionally more considerable quantities are present. It is true that, except in a small number of cases, the proportion of arsenic has not been sufficiently great to constitute a serious source of danger, but its presence is evidence of discreditable carelessness on the part of the manufacturers; and it would be well for pharmacists and physicians to adopt the rule of our laboratory, and inflexibly refuse to purchase any samples that contain the slightest trace of arsenic, or from which distilled water abstracts any recognizable soluble matters.‡

When the character of the local action of subnitrate of bismuth upon the alimentary mucous membrane is taken into consideration the limitations of its usefulness in the fluxes will readily be understood. It would seem worse than useless to resort to such a medicament during the active progress of diphtheritic dysentery, and, although it has sometimes appeared to do good during the early stages of catarrhal dysentery, it may well be questioned whether it would not often prove injurious if habitually resorted to in such cases as a sub-

* DE MUSSY—*loc. cit.*, note †, p. 789, *supra*. † *Circular No.* 6, p. 126, *op. cit.*, p. 571, *supra*.

‡ The danger of arsenical contamination was especially insisted upon by TROUSSEAU—T. II, p. 753, *op. cit.*, p. 716, *supra*. According to TAYLOR—*loc. cit.*, p. 791, *supra*—it is of common occurrence in the subnitrate used in England. It has happened in the Laboratory of the Surgeon General's Office that, of a dozen samples offered to the department by different dealers on a single occasion, *all* have been rejected on account of this impurity. The rule adopted by our chemist, Dr. WM. M. MEW, is to filter distilled water through one portion of the sample and evaporate the filtrate to dryness; another portion is tested for arsenic. All samples which yield a perceptible trace of arsenic or of residue from the filtrate are rejected. Yet we have always been able to purchase any quantity of the pure drug; and if others would follow our example, the contaminated article would disappear from the American market. For the convenience of country physicians and druggists, I mention the very simple means of testing qualitatively for arsenic recommended by Dr. MEW: The materials required are fragments of chemically pure zinc, chemically pure muriatic acid, corrosive sublimate, distilled water, test-tubes, a spirit-lamp and some cotton-wool. Half a teaspoonful of the sample of bismuth to be examined is introduced into a test-tube with a fragment of zinc; the tube is filled about a third full with a mixture of one part of muriatic acid to five of distilled water, and a plug of cotton-wool introduced loosely into its mouth to prevent the mixture from splashing over. It is then gently heated over the spirit-lamp. If any arsenic be present, arseniuretted hydrogen is generated, which is recognized by holding over the mouth of the tube a piece of filtering paper moistened with a solution of one part of corrosive sublimate to twenty parts of distilled water; a yellow stain is produced if arsenic be present. That the chemicals are all free from arsenic can be demonstrated by repeating the operation in another test-tube without the bismuth. The possibility of an injurious contamination with selenium and tellurium has recently been indicated by E. A. LETTS—*Some bismuth residues*, The Pharmaceutical Jour. and Transactions, London, Nov., 1878, p. 405: See also the report of the discussion of this paper in the Pharmaceutical Society—*op. cit.*, p. 417. Examining the residues of some commercial bismuth from Australia, LETTS detected the presence of betwen 12 and 20 per cent. of tellurium, besides selenium, gold and silver, and arrived at the conclusion that these residues "consist in all probability of a mixture of tellurides and selenides of the metals gold, silver and bismuth." In the course of the discussion of this paper Prof. ATTFIELD stated "that a very disagreeable odour was communicated to the breath and probably to the skin of some patients who took preparations of bismuth. Mr. Browne had stated that a sample of carbonate of bismuth which had caused these unpleasant effects contained tellurium, so the public, or at any rate, certain newspaper writers had jumped to the conclusion that the fœtor was due to the tellurium, but this was not yet proved." He asked if any such effect had been observed to follow the use of the preparations made from the sample of bismuth which yielded these residues. Mr. SCHACHT, who had furnished Mr. LETTS with the residues, stated that "he had not the slightest doubt that the preparations did contain something that caused these unpleasant symptoms. Some of the accounts he had received were scarcely credible, and he could not think that the whole of the effects said to be caused by an exceedingly small dose of tellurium were due to that cause. A fellow pharmacist had told him that he had given to his daughter, a little girl of about six years of age, a dose of this bismuth, and that it had made her breath smell of garlic for more than a week." Mr. J. S. TAYLOR called attention to lead as another impurity of bismuth. Lead has also been signalized, as an adulteration of the subnitrate of bismuth sold in the shops of Paris, by A. CARNOT—*Note de l'oxyde de plomb dans le sous-nitrate de bismuth des pharmacies*, read to the Acad. des Sci., March 18, 1878; I cite Gaz. Hebdomadaire, T. XV, 1878, p. 199—who found many samples which contained from one to three parts to the thousand, while others yielded to analysis as much as .6 to 1 per cent. The subject was subsequently investigated by A. RICHE—*Rech. sur le sous-nitrate de bismuth*, Bull. de l'Acad. de Méd., T. VII, 1878, p. 741—on behalf of the School of Pharmacy of Paris, who asserts that he found but a single sample in which the quantity exceeded one part to the thousand; in that the quantity was between three and four parts per thousand. These observations show the importance of the whole subject of bismuth adulteration, which is by no means satisfactorily disposed of when arsenic is excluded.

stitute for appropriate evacuants. Accordingly, Savignac earnestly protests that, although it is one of our best remedies in diarrhœa, it is not an antidysenteric, and insists that it should not be given in dysentery until the first violence of the attack is past, and the flux, assuming the characters of diarrhœa, threatens to become chronic.* Nor does it seem advisable to resort to this, any more than to other medicines, for the purpose of at once restraining the flux in the early stages of acute diarrhœa, especially if it be accompanied by severe gripings, abdominal tenderness or fever. By so doing we shall always run the risk of converting the diarrhœa into dysentery; perhaps, even, if we persist, of causing the dysentery to take on the diphtheritic character.

The true field for the operation of this admirable remedy is in painless diarrhœas after the use of evacuants, and in chronic fluxes. But in such chronic fluxes as we too often observed during the civil war, in which the constitutions of the victims were tainted with malaria and scurvy, and their thickened colons riddled with innumerable ulcers, how vain to hope to restore health merely by the administration of this or any other drying remedy. Change of air, suitable diet and appropriate constitutional treatment are indispensably demanded in such cases, and without their help no reasonable hopes for the success of any purely local remedies can be entertained; but if these general measures be duly employed, I do not doubt that bismuth is a valuable auxiliary, potent in dealing with the local affection. I accept the opinion of Brassac,† that by its use we can favor the cicatrization of intestinal ulcers; only, in these cases, still more than in fluxes uncomplicated by intestinal ulceration, we shall waste time if we give it in little doses. Monneret has justly ridiculed the attempt to obtain its local effects in any marked degree, on a surface so extensive as that of the alimentary mucous membrane, by the pitiful quantities with which some physicians are content;‡ but I incline to think that he has gone somewhat too far in this direction. In the great majority of suitable cases the flux can be restrained by a drachm or two of the drug daily; yet where it is clearly indicated, and these doses seem insufficient, I do not hesitate to follow the example of the French physician.

Most of the combinations with which it has been hoped to increase the efficacy of this drug should be regarded with distrust. The addition of calomel must be censured as an inexcusable error. As for opium, I incline to the view that in most of the cases in which it is indicated, bismuth should not be prescribed until the symptoms which require the anodyne have subsided. I do not regard with favor its combination with vegetable astringents, and the addition of the soluble mineral astringents is not to be thought of. The combination with an equal quantity of precipitated carbonate of lime, commended by Trousseau,§

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* SAVIGNAC—p. 405, *op. cit.*, p. 620, *supra*. BARRALLIER—p. 782, *op. cit.*, p. 603, *supra*—after relating the observations of BRASSAC and MAILLOT—see note §, p. 789, *supra*—declares that he has never employed the subnitrate of bismuth in acute dysentery.

† BRASSAC—p. 286, *op. cit.*, p. 789, *supra*—gives in support of his view an account of an autopsy performed on a patient dead of chronic dysentery and phthisis. This man had vainly taken the subnitrate of bismuth during the last few days of his life: the frequency of the stools was diminished, but he finally succumbed. On dissection four recent cicatrices, about the size of fifty-centime pieces, were found at the junction of the colon and rectum, as well as other ulcers in which the process of repair had evidently commenced. I do not regard this case as by any means conclusive, in view of the circumstance that cicatrices and cicatrizing ulcers are occasionally observed in fatal cases of chronic dysentery in which bismuth has not been given; nevertheless I have adopted, on the basis of clinical observation, the view of the author that bismuth favors the cicatrization of intestinal ulcers. I cannot agree with SAVIGNAC—*loc. cit.*, *supra*—when he writes of chronic dysentery, "je me croirais bien désarmé contre cette forme grave de la maladie si je n'avais pas d'autre médicament à ma disposition," if he intended by this expression to throw discredit on its use.

‡ MONNERET—T. LXXI, p. 482, *op. cit.*, note *, p. 789, *supra*.

§ TROUSSEAU—T. III, p. 113, *op. cit.*, p. 664, *supra*. I note that my friend Dr. JAMES E. REEVES, of Wheeling, West Virginia—*Medical notes*, The Medical Times, Vol. I, 1870-1, p. 315—advises a combination of bismuth, prepared chalk and Dover's powder, as the sole treatment in dysenteries preceded by diarrhœa: "Neither cathartics nor laxatives are to be administered, but the following powder is given in a teaspoonful of the tincture of cinnamon every four or six hours: ℞ Bismuth. subnit., gr. xvj–xxx; cretæ preparatæ, gr. x–xv; pulv. ipecac. comp., gr. iij–vj. M. One-half to one grain of powdered opium may be either added to or substituted for the Dover's powder." The dysenteries in which this treatment gave "so much satisfaction" must have been mild catarrhal forms. FONSSAGRIVES—T. IX, p. 538, *op. cit.*, p. 790, *supra*—speaks with commendation of the combination of the subnitrate of bismuth with magnesia, which I have not tried. I should prefer to use the magnesia, if indicated, separately.

is far less objectionable, and may perhaps prove occasionally useful in cases in which there is much gastric acidity, but it will generally be found that the mixture is less efficient than an equal quantity of bismuth given by itself.*

The *subcarbonate of bismuth*, regarded by Hannon of Brussels, as preferable to the subnitrate in gastralgia accompanied by an excess of acid in the stomach,† has sometimes been employed as a substitute for the subnitrate in the treatment of the fluxes. It was issued for this purpose to a limited extent during our civil war,‡ some of the medical officers regarding it as of equal efficacy, while others thought it inferior.§ I myself have had no experience with it. As for the soluble preparations of this metal, especially the *citrate of bismuth and ammonia*,‖ they are only named here that the reader may be warned against trifling with them. None of the good effects possessed by the subnitrate, in virtue of its insolubility, can be expected from them, and their use involves dangers which the prudent physician will avoid.

Tonics.—During convalescence from acute fluxes and the progress of chronic cases, the use of tonics is not unfrequently indicated. Of the *vegetable bitters*, suitable for this purpose, with which the Greek physicians were acquainted, a few, such as *gentian* and *chamomile*,¶ still survive, or are at least represented in modern pharmacy by allied plants.

* In this place I may refer to the *crème de bismuth* of QUESNEVILLE: see a letter by P. GAUBERT—*Sur l'emploi du sous-nitrate de bismuth, broyé et en pâte, sucré et aromatisé*, Le Moniteur Scientifique, T. II, 1859–60, p. 369; an article entitled *De la crème de bismuth contre la diarrhée*, same Jour., T. V, 1863, p. 309, and other laudations in the same Jour., T. VI, 1864, pp. 563 and 1157, T. X, 1868, pp. 891 and 1003. This preparation I understand to be simply the subnitrate suspended in water, with sugar and aromatics to give it an agreeable taste. I have never seen it; nor have I ever found any difficulty in getting even children to take the subnitrate without repugnance if a little sugar is added to it, so that I have felt no necessity for such a preparation.

† See an article entitled *De la préparation et de l'emploi thérapeutique du sous-carbonate de bismuth* in the Bull. Gén. de Thér., T. LII, 1857, p. 110. According to FONSSAGRIVES—p. 534, *op. cit.*, p. 790, *supra*—TROUSSEAU and PIDOUX, in the 7th Ed. of their *Traité de Thér.*, T. I, p. 208, which I have not been able to see, take a similar view. Among more recent writers I note that H. C. WOOD—p. 39, *op. cit.*, p. 675, *supra*—takes the ground that the actions of this preparation and the subnitrate are "so exactly similar that they can practically be considered as one thing."

‡ According to the report of Surgeon W. C. SPENCER, cited p. 708, *supra*, the total quantity of subcarbonate of bismuth purchased during the civil war was 132,963 ounces; but these figures include also all the subnitrate purchased. That neither preparation proved very efficacious during the war will be readily understood when it is stated that both were generally issued in 2-oz. bottles, that the quantity allowed general hospitals by the supply table was but 32 ounces yearly for a command of 1,000 men, and that none was authorized by the field supply table.

§ I have heard a great diversity of opinions expressed by medical officers in conversation on this subject, and confess I have been influenced by what I have heard to distrust the efficacy of the subcarbonate, perhaps unjustly.

‖ This preparation was first introduced, under the name of *liquor bismuthi*, by SCHACHT, of Clifton, England: See an article entitled *Chemical products and pharmaceutical preparations*, The Lancet, 1863, Vol. II, p. 49; also C. R. C. TICHBORNE—*Upon the administration of bismuth in the soluble form*, Pharmaceutical Journal and Trans., Vol. V, 1863–4, p. 301—with the appended remarks of SCHACHT and others, made when the paper was read in the Pharmaceutical Society. See also the method for compounding this preparation suggested by N. G. BARTLETT, of Chicago—*Bismuthi et ammoniæ citras*, Amer. Jour. of Pharmacy, Vol. XIII, 1865, p. 1. According to H. C. WOOD—p. 41, *op. cit.*, *supra*—this preparation "has the marked disadvantage of being irritant in large doses." The *tannate of bismuth* was introduced by CAP—*Note sur le tannate de bismuth*, Bull. de L'Acad. Imp. de Méd., T. XXV, 1859–60, p. 125—who reports that it has been used in diarrhœa with success by DEMARQUAY, ARAN, BOUCHUT and others. This preparation of bismuth is said to be quite insoluble, and therefore is not liable to the objections urged against the citrate. Is it better than the subnitrate, or as good? I have not been able to find published evidence to decide this question, and have never tried it myself. I see in the advertisement sheets of the American journals the titles of various elixirs of bismuth combined with calisaya bark, iron, strychnia, pepsin, or several of these ingredients; granular effervescent salts containing citrate of bismuth with pepsin, iron or strychnia; besides sundry lozenges, pills, &c., in which bismuth is similarly combined. I have no confidence in any of these preparations, and especially advise that all those in which the bismuth is in solution should be avoided.

¶ *Gentian*, the root of the *gentiana lutea*, has been supposed to be the same as the Γεντιανή of the Greek physicians: See DIOSCORIDES—Lib. III, Cap. 3, fol. 137. Ed. cited p. 623, *supra*; GALEN—*De simp. med. temp. ac fac.*, Lib. VI, Cap. 3, [Ed. Kühn, XI, 853,] and PAULUS ÆGINETA—Lib. VII, Cap. 3, Vol. III, p. 82, *op. cit.*, p. 624, *supra*. This drug was valued by the Arabian physicians also—compare EBN BAITHAR, T. I, p. 260, Ed. cited p. 704, *supra*—and had from the first the reputation of possessing alexipharmic properties, for it entered into the composition of the antidote of MITHRIDATES and the theriaca of ANDROMACHUS. That the doctors of the seventeenth century still held to these views may be seen in the work of DALE—p. 182, *op. cit.*, p. 729, *supra*—in which its virtues in plague and other venomous affections are lauded. For its more modern history, see especially ALSTON—T. I, p. 449, *op. cit.*, p. 772, *supra*; MÉRAT et DE LENS—T. III, p. 360, *op. cit.*, p. 788, *supra*; and the *Pharmacographia*, p. 389, Ed. cited p. 701, *supra*. The authors of the latter work express doubts whether the gentian of the Greek physicians was the species at present employed. It is probably impossible to arrive at a positive conclusion on this head. Among those who have employed this drug in the fluxes I may particularly mention TWINING—*loc. cit.*, p. 695, *supra*—who used the extract of gentian as an ingredient of his pills of ipecacuanha and blue mass. Under the designation *chamomile*, the flowers of *anthemis nobilis* are intended by the United States and British Pharmacopœias. DIOSCORIDES—Lib. III, Cap. 154, fol. 188 and 189, *op. cit.*—described three genera of Ἀνθεμίς. GALEN—*De simp. med. temp. ac fac.*, Lib. VI, Cap. 1, [Ed. Kühn, XI, 833,] and PAULUS ÆGINETA—Lib. VII, Cap. 3, Vol. III, p. 408, *op. cit.*—mention only one. AVICENNA—Lib. II, Tract. 2, Cap. 121, p. 286, *op. cit.*, p. 632, *supra*—on the other hand, like DIOSCORIDES, describes three kinds, distinguished by the color of their flowers. ADAMS, in his commentary on PAULUS—*loc. cit.*—expresses the opinion that the ancient anthemis or chamæmelum (Χαμαίμηλον, GALEN and PAULUS, *loc. cit.*) certainly embraced our modern chamomile, but probably was not restricted to it. For an account of the varieties used in modern times the reader is referred especially to DALE—p. 96, *op. cit.*; MURRAY—Vol. I, 1776, p. 143, *op. cit.*, p. 752, *supra*; ALSTON—Vol. II, p. 108, *op. cit.*; MÉRAT et DE LENS—Vol. I, p. 314, *op. cit.*; and the *Pharmacographia*, p. 341. ZIMMERMANN attached great importance to chamomile tea in the treatment of dysentery; next to opium he declared it afforded the best means of alleviating the pains—Cap. 5, S. 100, *op. cit.*, p. 648, *supra*. PRINGLE—Part III, Chap. 6, p. 272, *op. cit.*, p. 640, *supra*—held that fomenting the belly with chamomile tea and taking it internally was even better for mitigating the gripes and expelling wind in dysentery than opiates, which only palliate and often augment the cause. He regarded chamomile, like serpentaria, as possessed of antiseptic powers.

Still greater importance has been attached to certain vegetable bitters imported from the East and West Indies during the seventeenth and eighteenth centuries, among which *simaruba*, *cascarilla*, *quassia*, *calumba* and *serpentaria* may be particularly mentioned. Some of these drugs, especially simaruba and calumba, enjoyed during the last century a short-lived reputation as specifics in dysentery;* but modern physicians very generally recognize that they exercise no restraining influence upon the fluxes, and are valuable only when it becomes desirable to stimulate the flagging appetite and to endeavor to restore the exhausted strength of convalescent and chronic cases.† Often administered in infusion and decoction, they are also frequently employed to medicate wines and alcoholic liquors, and should then be administered with all the precautions advisable when alcoholic drinks are employed by themselves.

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* *Simaruba* is the bark of the root of *s. officinalis*, (De C.,) a tree growing in Guyana and the West Indies. According to DE JUSSIEU—*Rech. d'un specifique contre la dyssenterie, indiqué par les anciens auteurs sous le nom de Macer, auquel l'écorce d'un arbre de Cayenne, appellé Simarouba, peut être comparée et substituée;* I cite from PLANQUE'S *Biblioth. Choisie de Méd.*, T. IV, Paris, 1753, p. 14, and the *Collect. Académique*, Partie Françoise, T. VI, 1781, p. 503—some of this bark was first brought from Cayenne to Paris about 1713, with the statement that the natives of Cayenne used it successfully in diarrhœa and dysentery. It was given to the Academy of Sciences and to FAGON, physician to the king, for trial; but the quantity was small, most of it was preserved as a curiosity, and nothing was learned, except that it was not dangerous, until 1718, when the very hot summer was followed by a good deal of dysentery, for which the little of the drug that remained was tried with success, after the failure of ipecacuanha and other remedies. Thereupon DE JUSSIEU made arrangements for further importation, and, in 1723, BARRERE having on his return from Cayenne brought with him fifty pounds of the bark, he used it successfully in bilious and bloody diarrhœas, as well as in obstinate and dangerous dysenteries, in the dose of 5ij in decoction. He admitted, however, that if administered without previous necessary evacuation the constipation it caused proved injurious. DE JUSSIEU fell into the error of attempting to identify this drug with the *macer* which DIOSCORIDES—Lib. I, Cap. 111, fol. 45-6, *op. cit.*, last page—declared to be useful in dysenteries and alvine fluxes. The Arabian physicians long before had confounded macer with mace; see the remarks of ADAMS on the macer of PAULUS ÆGINETA—T. III, p. 237, *op. cit.*, last page; see also MURRAY—Vol. III, p. 457, *op. cit.*, p. 752, *supra*. DEGNER—Cap. III, § 42 *et seq.*, p. 149 *et seq.*, *op. cit.*, p. 625, *supra*—following the example of DE JUSSIEU, gave it in the same dose, after appropriate evacuations, in the Nimeguen epidemic, and thought it especially advantageous when the discharges were bloody—p. 155; see also p. 269 and p. 286 *et seq.* ZIMMERMANN dealt with the question of the use of this drug with his usual sagacity; even when he was called in late in the disease—Cap. V, S. 102, *op. cit.*, last page—when, he tells us, simaruba, cascarilla and terra japonica are usually thought absolutely necessary, he gave sometimes an emetic and then relied on rhubarb. He admitted that in chronic cases, especially if the discharges are bloody, simaruba is no bad remedy—Cap. X, S. 496—but declared that in his judgment it does best where the patient merely requires to be strengthened; so long as the bowels harbor any putrid matters it is either useless or injurious—S. 495. PRINGLE—p. 281, *op. cit.*, p. 640, *supra*—informs us that after reading DEGNER'S work he made a few trials of simaruba with favorable results; but he pointed out that it proved salutary only when given in the third stage of the disease, and relates that HUCK, in North America, had arrived at a similar conclusion. J. P. FRANK—Vol. III, p. 452, *op. cit.*, p. 343, *supra*—obtained excellent effects in the latter stages of asthenic dysentery from a decoction of simaruba to which he added cinnamon-water and opium; and HAUFF—S. 417, *op. cit.*, p. 534, *supra*—states that it was used with advantage in the Wurtemberg epidemic. *Cascarilla* is the bark of the *croton eleuteria*, a shrub or small tree growing in the Bahama Islands. It was first brought to Europe some time during the seventeenth century, and was described by J. A. STISSER—*Actorum laboratorii chemici in Acad. Julia specimen secundum*, Helmstadt, 1693, Cap. 9, De cortice eleuterii pro cortice Peruviaee Chica Chica veedito. DEGNER—Cap. 3, § 54, p. 164 *et seq.*—regarded the use of cascarilla in dysentery with almost as much favor as he did simaruba. He held that it not merely corroborated the relaxed intestines, but moderated the febrile movement and the abdominal pains: he administered the powder or the tincture, usually in combination with rhubarb, catechu, simaruba or other remedies. It has since his time been frequently employed as an aromatic bitter in dysentery and chronic fluxes. *Angustura*, the bark of the *galipea officinalis*, which was not brought into general use until after the publication of the observations of BRANDE in 1791—see the *Pharmacographia*, p. 97, Ed. cited p. 703, *supra*—has also had a limited use for the same purpose. *Quassia*, the wood of the *simaruba excelsa*, (De C.,) was formerly derived solely from the quassia amara, (L.,) an allied shrub or small tree growing in Surinam. The medicinal virtues of the latter were made known in Europe through ROLANDER, who, in 1756, carried some of it to Stockholm; and in 1763, LINNÆUS, with the help of a flowering branch with leaves, &c., brought from Surinam in spirits of wine by DAHLBERG, described the tree botanically. ROLANDER had found it in use in Surinam in the hands of a negro named QUASSI, (or COISSI,) who gave it as a secret remedy in the malignant fevers of that country with such success that he thought it worth while to purchase the secret: Compare C. M. BLOM—*Lignum quassiæ*, (Linné præside,) Amœn. Acad., T. VI, p. 416, and J. A. MURRAY—Vol. III, p. 432, *op. cit.* According to *The Pharmacographia*—p. 118—this Surinam quassia is still employed in France and Germany, but in the London Pharmacopœia it has been superseded by the *picræna excelsa*, (Lindl. s. excelsa, De C.,) which is official in our own Pharmacopœia. MURRAY—p. 449, *op. cit.*—cites some accounts of its use in diarrhœa and in lienteries succeeding dysentery, but it never shared the great reputation of simaruba in the latter disease. *Calumba*, (columbo,) the root of the *jatrorhiza palmata*, (MIERS,) *cocculus palmatus*, (De C.,) a native of Mozambique and other parts of Africa, was brought to Europe by the Portuguese in the 17th century, and is mentioned by FRANCESCO REDI—*Esperienze intorno a diverse cose naturali*, &c., Florence, 1671; I cite from a modern reprint of his *Opere*, Vol. IV, Milan, 1811, p. 119—as an alexipharmic worthy of further trial. Among the natives of Eastern Africa it enjoyed the reputation of being beneficial in various diseases, among others dysentery, and during the last century it was brought into use for this and other fluxes in Holland, France and England: see MURRAY—T. VI, p. 154, *op. cit.*, and the *Pharmacographia*, p. 22, *op. cit.* PERCIVAL—Vol. I, p. 266, *op. cit.*, p. 770, *supra*—declared that he had "often observed very salutary effects from its use, in diarrhœas, and even in the dysentery;" and expressed the opinion that it may often be prescribed with safety and advantage in the early stages of these disorders, when astringents would be hurtful. CULLEN—Vol. II, p. 78, *op. cit.*, p. 740, *supra*—however, referring to PERCIVAL'S essay, remarks that, so far as he could learn, its employment in dysentery "has not prevailed in Britain." *Serpentaria* or *Virginia snakeroot*, the root of *aristolochia serpentaria*, was first brought to the notice of European physicians by THOMAS JOHNSON in his edition of GERARDE'S *Herball*, published in 1636. (ALSTON—T. I, p. 520, *op. cit.*, p. 772, *supra*—and MURRAY—T. I, p. 348, *op. cit.*—say 1633; I have followed the date given in the *Pharmacographia*, p. 532, which agrees with the date of the edition referred to as given in the *Biographie Universelle*, T. XVII, 1816, p. 176. Our library does not possess the edition.) Like other drugs, mentioned in this and the previous note, it was at first regarded as an alexipharmic. According to DALE—p. 194, *op. cit.*, p. 729, *supra*—it cures the bites of mad dogs, averts hydrophobia, and is the most certain and immediate remedy against the bites of venomous serpents. PRINGLE employed a decoction of it in dysentery complicated with the hospital fever—Part III, Chap. 6, p. 274, *op. cit.*—combining it commonly with Peruvian bark and laudanum, or at other times, "and especially when the pulse was sunk," merely adding to it some of the theriaca of ANDROMACHUS; he used it also in hospital fevers without dysenteric complication—p. 311—and regarded it as a powerful antiseptic—see *Appendix*, pp. xii, xx, xxvi and xxvii.

† Compare, for example, the well expressed views of SAVIGNAC—p. 393, *op. cit.*, p. 620, *supra*, and STILLÉ—pp. 375 and 379, *op. cit.*, p. 650, *supra*—with regard to the use of the vegetable bitters in the fluxes.

But by far the most important of the vegetable tonics employed in these diseases is *Peruvian bark* and its precious alkaloid *quinia*.* Richard Morton relied chiefly upon this bark, in combination with opium, in the diarrhœas and dysenteries that prevailed in London from 1666 to 1672, and which he regarded as masked forms of intermittent fever.† Torti (1709) boldly employed it in the dysenteric and atrabiliary fluxes, which he held to be manifestations of pernicious fever.‡ Almost all those subsequent writers who have believed malaria to be one of the chief causes of diarrhœa and dysentery have followed the example of these physicians, and have used the bark or its alkaloid in all the fluxes they have attributed to this endemic influence.§ Moreover, since the time of Hoffmann, many physicians who have refused to adopt this etiological view have nevertheless resorted to the bark as a tonic and supporting remedy in the appropriate stages of the fluxes;‖ while the reputation it acquired during the early part of the eighteenth century in the treatment of low fevers, and as a means of combating putridity of the humors, led Tissot, Zimmermann, Pringle, Robert Whytt, Donald Monro and others to employ it in the adynamic forms of dysentery and in dysenteries complicated with hospital fever.¶

But it did not take its place among the recognized remedies for the fluxes without loud opposition. Degner declared that certain military surgeons by its use, or rather abuse, had killed whole companies of their soldiers;** and Broussais asserted that during the French campaign of 1806 in Germany he found that Peruvian bark as well as the other bitters were not well borne in intermittent fevers complicated with fluxes.†† All such opposition, however, has been silenced by accumulated experience; since the successful isolation of quinia that alkaloid has come more and more into use as a substitute for the bark in most

* The story of the introduction of *cinchona bark* into European medicine can only be alluded to here. It began to attract notice during the first half of the seventeenth century. LOPEZ DE CANIZARES, the Spanish corregidor of Loxa, is said to have been cured of a fever by it in 1630, and hearing in 1638 that the Countess of Chinchon, wife to the viceroy of Peru, was suffering with an obstinate tertian, he sent her physician, JUAN DE VEGA, a package of the bark, which speedily restored her to health. The countess became an active advocate of the new remedy, and caused its distribution to such an extent that it acquired the name of *The Countess' Powder*. It speedily found its way to Europe, where it was long known as *The Jesuits' Powder*, on account of the active part taken by that religious organization in distributing it and favoring its employment. For an account of the fierce battles waged between its advocates and the more conservative physicians of the age, I must refer the reader to the numerous historical works on the subject. I regret to say that some of the most important of these have not yet found their way to our library. Not only do I miss the earlier works of J. J. CHIFFLET—*Pulvis febrifugus orbis Americani ventilatus*, Paris and Louvain, 1653, and of ROBERT TALBOR (or TABOR)—*Pyretologia, a rational account of the causes and cure of agues*, London, 1672—who did so much afterwards towards popularizing the remedy in England, but even such modern treatises as that of MARKHAM—*Chinchona Species of New Granada*, London, 1867. The reader will find summary historical accounts with references to the literature in the work of J. F. MAUTT—*Diss. de cortice Peruviano*, Leyden, 1760; I cite the reprint in SANDIFORT'S *Thesaurus dissertationum*, Vol. I, Rotterdam, 1768, p. 175; MURRAY—T. I, p. 546, *op. cit.*, p. 752, *supra;* MÉRAT et DE LENS—T. V, pp. 594 and 615, *op. cit.*, p. 788, *supra;* STILLÉ—Vol. I, p. 495, *op. cit.*, p. 711, *supra;* and the *Pharmacographia*, p. 304, Ed. cited p. 703, *supra*. *Quinia* and *cinchonia*, the most important of the alkaloids of Peruvian bark, were not isolated as separate bases until 1820 by PELLETIER and CAVENTOU—*Rech. chimique sur les quinquinas*, Annales de Chim. et de Phys., T. XV, 1820, p. 289. For an account of these and the other alkaloids, with a good bibliography, I may refer to the work of the HUSEMANNS—S. 283, *op. cit.*, p. 766, *supra*.

† RICHARD MORTON—*op. cit.*, p. 399, *supra:* for an account of this epidemic see p. 420 *et seq.* He gave in the dysenteric cases 3j of the bark and gr. j of the solid laudanum of the London Pharmacopœia every four or six hours—p. 425. This was his usual treatment for that protean disease, intermittent fever, when it put on the type of simple vomiting, cholera morbus, tormineus diarrhœa or dysentery, as well as in its ordinary forms—pp. 83–4.

‡ TORTI—*loc. cit.*, p. 399, *supra*.

§ Consult the authorities cited in discussing the complication of dysentery with malarial fever—p. 399 *et seq.*, *supra*.

‖ HOFFMANN—T. III, p. 156, *op. cit.*, p. 681, *supra*—approved of the use of Peruvian bark in dysentery after the noxious material was evacuated and the spasm of the intestine quieted: he used also cascarilla and other tonics for the same purpose.

¶ TISSOT—T. III, p. 27, *op. cit.*, p. 625, *supra*—gave extract of bark with orange-flower water in malignant dysenteries. ZIMMERMANN—Cap. X, S. 471, *op. cit.*, p. 648, *supra*—held that in the advanced stages of dysentery, when, as sometimes happens, the pulse sinks and the strength fails, all the remedies required in the malignant fevers are needed, and above all others Peruvian bark. He censured the views of DEGNER with regard to this remedy as unphilosophical—S. 472. PRINGLE—p. 274, *op. cit.*, p. 640, *supra*—commonly used a decoction of Peruvian bark with Virginia snake-root to which he added a few drops of laudanum, in dysenteries complicated with hospital fever, or in those in which the flux continued until the strength was much impaired. ROBERT WHYTT—*Of the use of bark in dysenteries*, &c., (read before the Philosophical Society of Edinburgh, January, 1761.) Essays and Obs., Phys. and Literary, Vol. III, 1771, p. 366—gave with advantage a decoction of Peruvian bark, to which he added some of the confectio japonica of the Edinburgh Dispensatory, in dysenteries, even of the worst kind, "accompanied with a putrid disposition of the humours, and a malignant fever." DONALD MONRO—p. 89, *op. cit.*, p. 625, *supra*—following the example of MORTON, PRINGLE and WHYTT, all of whom he cites, gave in similar cases the powdered bark in half-drachm doses, or scruple doses of its extract, in connection with "the Mindereri draughts, with four or five drops of the tinctura thebaica." Even CULLEN—T. II, p. 106, *op. cit.*, p. 740, *supra*—admitted that the bark may possibly be employed with advantage "in the advanced state, [of dysentery,] when some symptoms of putrescency appear, or when the disease has changed in some measure into the state of diarrhœa."

** DEGNER—p. 239, note, *op. cit.*, p. 625, *supra:* "Ast ab amico certior factus sum, ultimo belli tempore chirurgos quosdam castrenses ex corticis hujus usu, vel forsan abusu, multos cohortis suæ milites letho dedisse."

†† BROUSSAIS—T. II, p. 594 *et seq.*, *op. cit.*, p. 643, *supra*.

of the conditions in which it was formerly given; and the questions connected with their use have been so fully debated that at the present time I suppose the great majority of practitioners are substantially in accord with regard to the more important indications for the administration of these remedies in the fluxes.

In the first place they are valuable as tonics, and may usually be employed for this purpose whenever tonics are required.* Many physicians will agree with Stillé, that the decoction of Peruvian bark, or Huxham's tincture, is preferable to quinia when a tonic and not an antiperiodic operation is intended;† and whenever the principal object is to spur the flagging appetite, I am willing to accept this view, but I am not disposed to underestimate the purely tonic influence of quinia; and that alkaloid can often be given with advantage when the decoctions would be rejected by the stomach. Not merely in the debility of convalescence and the enfeebled condition that so often accompanies the chronic fluxes, but in the prostration approximating collapse that occurs during diphtheritic dysentery, the administration of quinia is often one of the most important of the supporting measures at our disposal. Vogt, who has urgently insisted upon its usefulness under these circumstances, has correctly pointed out the ease with which it is absorbed from the alimentary canal, and the fact that it rarely irritates the inflamed mucous membrane: his view that it checks the tendency to anæmia and favors the new formation of red blood globules will hardly sustain adverse criticism;‡ but the beneficial effects which he thus endeavors to explain have been repeatedly observed by others. All the reasons that can be brought forward in favor of the use of quinia as a supporting measure in external gangrenous processes apply here; and if its administration not infrequently proves unsuccessful, it is at least one of the best remedies at our command in these unfortunate cases.

In the second place, there is little difference of opinion as to the usefulness of these preparations in fluxes complicated with malarial fever. The bark was recommended for this purpose by Tissot, Cleghorn, John Clark, Cullen, Rollo, Harty and a host of other physicians during the last century and the early part of this;§ while quinia, already brought into use as a substitute by Biermann, has been preferred by Naumann, Hauff, Haspel, Hare, Morehead, Maclean, Aitken, Stillé and many others.‖ The erroneous practice of Tissot,

* I shall not attempt to enumerate the writers who during the present century have praised the use of Peruvian bark or its alkaloid as tonics in the fluxes. The view of HARTY—p. 204, *op. cit.*, p. 732, *supra*—who shrewdly spoke of it as a corroborant, useful "to obviate acute or chronic debility," is substantially adopted by HASPEL—T. II, p. 138, *op. cit.*, p. 621, *supra;* SAVIGNAC—p. 393, *op. cit.*, p. 620, *supra;* BARRALLIER—p. 784, *op. cit.*, p. 603, *supra;* HEUBNER—Bd. II, Abth. 1, S. 548, *op. cit.*, p. 529, *supra;* and many others, most of whom use indifferently quinia or the Galenical preparations of bark for this purpose.

† STILLÉ—p. 375, *op. cit.*, p. 650, *supra*. *Huxham's tincture* here praised, which contained, besides the bark, serpentaria, bitter-orange peel, saffron and cochineal, (the U. S. Pharmacopœia of 1870 omits the last two ingredients,) was described by J. HUXHAM in his *Liber de febribus*, [1739,] Opera, T. II, p. 118, Ed. cited p. 660, *supra*.

‡ VOGT—S. 206, *op. cit.*, p. 645, *supra*. I may add that MALININ—*Ueber den Einfluss der Galle auf die Chininsalze*, Centralblatt für die med. Wiss., Jahrg. VI, 1868, S. 370—supposed that since quinia is precipitated from solution by the bile it can only be absorbed in the stomach, and that whatever reaches the intestine becomes insoluble and is lost with the fæces; but G. KERNER, who has made an elaborate study of the mode in which the drug is absorbed—*Beiträge zur Kenntniss der Chinin-Resorption*, Pflüger's Archiv, Jahrg. II, 1869, S. 200, and Jahrg. III, 1870, S. 93—has shown conclusively that although the precipitate is less soluble than the sulphate of quinia, it is nevertheless capable of being absorbed. And in point of fact, when this preparation is administered instead of the sulphate, the greater part of large doses is excreted with the urine, and only a small portion passes out with the fæces, while in the case of small doses none escapes by the rectum, but all in the urine—Jahrg. III, S. 155. The rapid absorption of quinia from the rectum, long well known clinically, has also been made the subject of experimental demonstration by this observer—S. 158–160.

§ TISSOT—T. III, p. 13, *op. cit.*, p. 625, *supra;* CLEGHORN—pp. 255–56, *op. cit.*, p. 637, *supra*. JOHN CLARK—p. 224, *op. cit.*, p. 709, *supra*—held that "Peruvian bark, from its corroborant, astringent, and antiseptic virtues, seems to be well adapted for the cure of this disease, [dysentery,] especially when it depends on the same causes which produce remittent fevers." But he thought that "it is not near so great a specific in fluxes as in fevers," for although it was attended with the most "wonderful effects" in the putrid flux at Bengal, it failed when he essayed it in the dysenteries he subsequently observed in the Straits of Malacca, China and England. CULLEN—*loc. cit.*, note ¶, last page—taught that when dysentery "puts on a tertian type, and may be considered as a part of the tertian fever, at the same time epidemically prevailing, the bark may become an absolutely necessary remedy." HARTY—*loc. cit.*, note *, *supra;* I cite the opinions of ROLLO from this work—p. 207.

‖ BIERMANN—*Bemerkungen über eine in dem Bezirke meines Physikats im August und September dieses Jahrs herrschende Ruhr-Epidemie, complicirt mit Wechselfieber*, &c., Med. Conversationsblatt, 24 März, 1832, S. 88; NAUMANN—Bd. IV, Abth. 2, S. 94, *op. cit.*, p. 645, *supra;* HAUFF—S. 450, *op. cit.*, p. 534, *supra;* HASPEL—*loc. cit.*, note *, *supra;* HARE—p. 460, *op. cit.*, p. 401, *supra;* MOREHEAD—p. 304, *op. cit.*, p. 657, *supra;* MACLEAN—Vol. I, p. 123, *op. cit.*, p. 657, *supra;* AITKEN—Vol. II, p. 660, *op. cit.*, p. 647, *supra;* STILLÉ—p. 376, *op. cit.*, p. 650, *supra*.

who advised that in this complication, as a general rule, the dysentery should be cured first and the fever combated afterward,* has long since fallen into deserved discredit, and no prudent practitioner will now hesitate to cut short the febrile movement with quinia as speedily as possible.

What is then likely to happen was long ago correctly observed by Cleghorn, who frequently made use of the bark in the periodic dysenteries of Minorca. In some of his cases it effectually put a stop to both the fever and the flux, but in others, although it arrested the fever, the flux continued without much alteration.† Which of these two results is likely to happen in any case will depend in part upon the intensity of the malarial complication, in part upon the severity of the flux.‡ When the intestinal inflammation is severe, or has assumed the diphtheritic characters, it is idle to expect that it will be checked by the arrest of the malarial fever; but even in these serious cases the cure of the febrile movement withdraws a most injurious influence, the continued action of which tends to prolong the flux and increase its unfavorable tendencies. When, however, the flux depends upon a catarrhal inflammation of moderate intensity, the relief afforded by the removal of the malarial complication is often accompanied by its speedy cessation; and it is not surprising that some of those who have witnessed such results should have too hastily concluded that similar effects may be expected from quinia in all cases of dysentery.

This view has been maintained by a number of the physicians in our Southern States, especially by Robert Campbell of Georgia.§ I do not doubt in the least the success reported to have attended the use of quinia in these southern dysenteries, because I do not doubt its utility in cases complicated by the effects of the malarial poison, whether manifested by distinctly periodic fever or by the more subtle and obscure symptoms of chronic malarial cachexia; but I have elsewhere endeavored to show that, although the fluxes may be variously complicated by the operation of the malarial influence, it is not to be regarded as their cause;‖ and if this view be correct we are not justified in expecting more from quinia, even in these cases, than the removal of the malarial complication. Still less are we warranted in relying upon it in uncomplicated fluxes; and in these its substitution for more appropriate treatment cannot fail to be attended with disastrous results.

Quinia becomes also a most important remedy in those chronic fluxes which are complicated by malarial fever, or occur in individuals laboring under the malarial cachexia.¶ In such cases it will often prove quite impossible to check the flux until the malarial element has been eliminated by its means; but in these cases also it is important that it should be regarded as an agent by which we can remove a dangerous complication rather than relied upon on account of any direct influence it may be imagined to exert upon the

* TISSOT—*loc. cit.*, note §, last page: "Quelquefois elle est compliquée avec une fièvre d'accès; il faut guérir premièrement la dyssenterie, et ensuite la fièvre." We must, however, do him the justice to add that he made an exception to this rule if the paroxysms of fever were violent.

† CLEGHORN—*loc. cit.*, note, last page: "The great similitude there is in many respects between tertian fevers and dysenteries, induced me frequently to make use of the bark in the last named disease. When the fever and gripes were regularly exasperated, either every day or every other day at stated periods, it has often effectually put a stop to both; especially if the exacerbation began with chillness, and terminated in sweats: At other times it removed the fever, the flux continuing without much alteration."

‡ STILLÉ—*loc. cit.*, note ‖, last page—has observed: "Dysentery complicated with periodical fever is amenable to quinia in proportion to the predominance of the periodical type;" but this view only takes into account the malarial factor, as though the intestinal lesion were of no consequence.

§ R. CAMPBELL—*loc. cit.*, p. 402, *supra*. This able practitioner formulates his leading idea in the following emphatic language: "But what we say is; GIVE QUININE IN DYSENTERY"—Vol. XIV, p. 81, *op. cit.* The capitals are his own. It would do him injustice not to add that he attaches importance to other remedies, especially to oil of turpentine, laxatives, rest and supporting measures, but he places quinine in the first rank: "Quinine should be given *unconditionally*, and irrespectively of the other elements of treatment"—p. 76, *op. cit.* The italics are his own. See also the papers of H. W. DAVIS, GREENSVILLE DOWELL and others, cited on p. 402, *supra;* and that of R. L. PAYNE, of Lexington, N. C.—*Dysentery, its treatment by opium, ipecac and quinine*, Virginia Med. Monthly, Vol. III, 1876, p. 430—who doubtless speaks on the basis of accurate observation when he writes: "I live in a malarious section of country, and I find that many of my flux patients will not improve until I give them quinine"—p. 433.

‖ See pp. 287, 398 *et seq.*, 414 *et seq.*, 495 and 637, *supra*.

¶ Compare the intelligent views of S. H. WARD, physician to the Dreadnought hospital—*op. cit.*, p. 697, *supra*—on this subject.

intestinal lesions.* Both with a view to its tonic effects and as a means of combating the malarial complications which so frequently existed, quinia was extensively employed in the treatment of the fluxes during our civil war.† Some of our medical officers took the view that the malaria of the regions in which our armies operated was the immediate cause of the fluxes observed; others regarded it as merely a complication of the intestinal disorders generated by other influences. Both classes resorted to quinia with a liberal hand. It cannot be pretended that it was always discreetly used, that it was not often withheld when sorely needed and lavished when other remedies would have been of greater service; but on the whole, I suspect the sins of omission were greater than those of commission, and that the errors of those who gave it to excess were among the most pardonable and least injurious of the therapeutical errors of the war.

In addition to the foregoing long recognized indications for the use of quinia in the fluxes, several others have been brought into prominence during the last few years which deserve brief notice in this place. One of these is based upon the power possessed by this alkaloid of diminishing abnormal temperature in fever. Vogt, Wachsmuth, and especially Liebermeister, have drawn attention to this effect of the drug, and have been the means of introducing its extensive use in typhoid and other continued fevers as a potent method of controlling the abnormal temperature.‡ The reality of this influence must be admitted to be firmly established by trustworthy testimony. It does not appear to cut short the

* The occasional success of quinine in chronic cases in which the malarial element is obscure is well calculated to mislead the unwary: See, for instance, those reported by A. FERRAND—*Diarrhée chronique datant de neuf mois traitée sans succès par les moyens ordinaires, guérie subitement par le sulfate de quinine*, Bull. Gén. de Thér., T. LXXVII, 1869, p. 20; and JULES SIMON—*Cas rare de diarrhée, datant de vingt ans*, &c.; *nouvel emploi du sulfate de quinine et nouvel et rapide succès*, &c., Bull. et Mém. de la Soc. Méd. des Hôpitaux de Paris, T. VI, 1869, p. 74.

† See, in illustration of the freedom with which it was administered, the reports in Section II, cited on p. 403, *supra*, as affording testimony to the frequency of malarial complications, as well as the reports of WOODWARD—p. 51, *supra;* HOLSTON and READ—p. 66; BRADLEY—p. 67; PEASE—p. 69; WHITTINGHAM—p. 70; FOYE—p. 73; WOOD—p. 74; MCKELWAY—p. 76; BROWN and CADY—p. 77; MULFORD—p. 80; BIGELOW—p. 83; TUTTLE—p. 90; PYLE and HOFF—p. 91; MORSE—p. 92; COOK—p. 93; COFFMAN—p. 97; BATES—p. 99; and READ—p. 100. See also the paper of W. C. OTTERSON, Surgeon, U. S. V.—*Diseases in camp. Their causes and treatment*, The American Med. Times, Vol. VI, 1863, p. 135—who remarks: "The periodic diarrhœa is purely of malarious origin, and to be treated accordingly: quinine and iron is the best combination." When it is remembered that very nearly a million cases of ague and about half a million cases of remittent and continued fevers were reported to the Surgeon General's Office during the war—see the First Medical Volume, Tables C and CXI—and that bark and quinia were used not only in these but many other morbid conditions, it will be understood that the statement throws no light whatever on the quantity employed in the fluxes; yet it is not without interest in this connection to learn from the report of Surgeon W. C. SPENCER, cited p. 708, *supra*, that the following figures represent the purchases by the Medical Department during the war: Calisaya bark, powdered, 259,258 oz.; fluid extract of cinchona, 518,957 oz.; sulphate of quinia, 595,544 oz.; pills of sulphate of quinia, (1 to 3 grs. each.) 392,970 dozen; citrate of quinia and iron, 50,772 oz.; sulphate of cinchonia, 343,226 oz. These figures represent over 19 tons of sulphate of quinia and about half as much sulphate of cinchonia besides the other preparations.

‡ W. VOGT—*Ueber die fieberunterdrückende Heilmethode (Methodus antipyretica), und ihre Anwendung bei acuten Krankheiten überhaupt*, Schweizerische Monatschrift für praktische Medizin, Jahrg. IV, Mai-Juli, 1859, S. 149 u. 213. A. WACHSMUTH—*Typhus ohne Fieber?* Archiv der Heilkunde, Jahrg. IV, 1863, S. 55. C. LIEBERMEISTER—*Ueber die antipyretische Wirkung des Chinin*, (with 58 illustrative temperature curves,) Deutsches Archiv für klin. Med., Bd. III, 1867, S. 23 u. 569; also his article on *Abdominaltyphus* in ZIEMSSEN'S Handbuch, Bd. II, Theil I, S. 220. LIEBERMEISTER testifies that VOGT (whose work on dysentery—*op. cit.*, p. 645, *supra*—I have frequently quoted) was the first to use quinia in proper doses as an antipyretic in typhoid fever. WACHSMUTH adopted the same method, but LIEBERMEISTER deserves the credit of having established its reputation. He prescribes from 22 to 45 grains of the sulphate or muriate of quinia to be taken within the space of half an hour, and then does not repeat the dose till the next day or the day after, in accordance with the effect upon the temperature, which he expects to be reduced to about the normal standard, 38° centigrade in the rectum. If this does not happen he increases the next dose; if, however, the temperature falls to 37° centigrade or less, he diminishes it. He uses this method in connection with his favorite cold baths, and declares that if he were reduced to the unpleasant alternative of choosing between the baths and the quinia, he should in the majority of cases select the latter. HAGENBACH—*Ueber die Anwendung des Chinin in den fieberhaften Krankheiten des kindlichen Alters*, Jahrb. für Kinderheilkunde, Bd. V, 1871-2, S. 181—adopted the same method with success in the febrile diseases of children; as did also RAPMUND—*Das Chinin in der Kinderpraxis, besonders bei fieberhaften Krankheiten und Keuchhusten*, Deutsche Klinik, Bd. XXVI, Jahrg. 1874, S. 51. The subject has been investigated by C. MURCHISON, E. S. THOMPSON and H. WEBER, as a committee of the Clinical Society of London—*Report of committee appointed to investigate the value of quinine as a means of diminishing bodily temperature and pulse in pyrexia*, Trans. of the Clin. Soc. of London, Vol. III, 1870, p. 201—who, after experiments in typhoid and typhus fevers, pneumonia, measles, scarlet fever, &c., concluded: "That large doses of quinine have a marked effect in reducing the temperature in pyrexia, and a less marked effect on the pulse and respiration"—p. 203. See also the paper of CLIFFORD ALLBUTT—*On the antipyretic action of quinine*, The Practitioner, Vol. XII, 1874, p. 29—who, although he combats the notion that quinia possesses the antiseptic virtues some have assigned to it, (vide *infra,)* is compelled to admit its power in lowering the febrile temperature. Efforts to ascertain by experiment the mode in which this lowering of temperature is effected have been made by P. LEWIZKY—*Ueber den Einfluss des schwefelsauren Chinins auf die Temperatur und Blutcirculation*, Centralblatt für die med. Wiss., Jahrg. VII, 1869, S. 209, and Virchow's Archiv, Bd. XLVII, 1869, S. 352—who has endeavored to show that the effect is produced by a direct diminution of the heat production. B. NAUNYN u. H. QUINCKE—*Ueber den Einfluss des Centralnervensystems auf die Wärmebildung im Organismus*, Archiv für Anat., Phys. und wiss. Med., Jahrg. 1869, S. 526—found that quinine sometimes even succeeded in preventing the rise of temperature that follows section of the spinal cord, but in other instances it failed to have this effect. Similar experiments were made by C. BINZ—*On quinine and alcohol in paralytic fever*, The Practitioner, Vol. V, 1870, p. 4—with like results: "If the conditions of the fever are too favourably constituted, the effect of quinine fails thoroughly." See also the observations of N. JERUSALIMSKY—*Über die physiologische Wirkung des Chinin*, Berlin, 1875, S. 21—as to the influence of quinia on the temperature.

natural course of specific fevers, but by controlling the abnormal temperature diminishes the frequency of intercurrent lesions and increases the chances of recovery. For this purpose it must be given in a single considerable dose, twenty to sixty grains, once in twenty-four or forty-eight hours; the precise quantity to be taken and the frequency of its repetition being regulated after the first dose by observation of the temperature. In view of the rapidity with which it is eliminated by the kidneys,* the effect upon the temperature of such doses, if given at once or at least in divided portions within an hour, will be greater than can be obtained from the same quantity taken at intervals in the course of the twenty-four hours.

The success of this method in typhoid fever and the absence of reliable evidence that it ever produces any injurious effect in this disease show that it may safely be resorted to in dysentery, or other fluxes accompanied by fever, and it appears to be well worthy careful trial in these conditions. In dysenteries complicated by typhoid fever,† as well as when the malarial fevers coexist, this antipyretic influence will doubtless prove serviceable; but in the majority of uncomplicated fluxes, even in diphtheritic dysentery after the early stages, the temperature seldom rises high enough to be itself a source of danger,‡ so that the use of quinia for this purpose will be restricted to a comparatively limited number of cases.

Attention has also been directed recently to the power said to be possessed by quinia of checking tissue-metamorphosis. The testimony on this head is not so accordant as could be wished, yet appears sufficient to render it probable that quinia does operate in this way, although the observations of Unruh show that it sometimes fails to produce this effect in fever, just as it sometimes fails to lower the temperature.§ What is known on the subject must

* The excretion of quinia by the urine, long since recognized by LANDERER—*Untersuchung des Harns eines mit grossen Gaben Chinin behandelten Fieberkranken*, Buchner's Repertorium für die Pharmacie, Bd. LV, 1836, S. 231; VALLÉE—same Bd., S. 380; QUEVENNE—*Note sur la présence dans l'urine de la quinine administrée à haute dose*, Jour. de Chim. Méd., T. IV, 1838, p. 460; P. BRIQUET—*Traité Thér. du Quinquina et de ses Préparations*, Paris, 1853, p. 229—and others, has been made the subject of elaborate investigations by H. M. THAU—*Ueber den zeitlichen Werth der Ausscheidungsgroesse des Chinins bei Gesunden und fieberhaft Kranken*, Inauguraldissertation, Kiel, 1868; and KERNER—*op. cit.*, p. 798, *supra*. THAU, in three experiments on healthy individuals, who had taken altogether 6 grammes of sulphate of quinia, equivalent to 4.4586 grammes of quinia, recovered from the urine within 48 hours 4.3 grammes of quinia, leaving only .1586 gramme unaccounted for. More than a third of the quantity excreted was passed during the first 6 hours, and about three-fourths during the first 12 hours. In three experiments on typhoid patients the same quantity was taken; 4.267 grammes of quinia were recovered from the urine, leaving only .1916 gramme to be accounted for. The proportion excreted during the first 12 hours was about the same as in the healthy cases; the disease appeared to exercise no noteworthy influence on the absorption or elimination of the drug. These observations have been cited by BINZ—*Pharmakologische Studien über Chinin*, Virchow's Archiv, Bd. XLVI, 1869, S. 167—who has apparently, in consequence of supposing the 4.3 grammes excreted to be sulphate as well as the 6 grammes swallowed, erroneously credited THAU with having recovered from the urine a little more than two-thirds of the quantity swallowed only, whereas his figures really represent 96 per cent. And H. C. WOOD—p. 69, *op. cit.*, p. 675, *supra*—has, perhaps in consequence of this discrepancy, been led into the amusing error of supposing the passage just cited from BINZ to refer to a series of experiments by BINZ himself, differing in their tenor from those of THAU. KERNER—Jahrg. III, S. 117, *op. cit.*—holds that a part of the quinia is excreted by the kidneys in a modified form, probably identical with the *dihydroxylquinine* which can be formed out of the body by the oxidation of quinia by means of permanganate of potash; and BINZ—p. 6, *op. cit.*, note ‡, last page—has suggested that, as this substance has no physiological action, the conversion into it of an undue proportion of the alkaloid by excessive oxidation in high fever may account for the failure of quinine to act in some such cases. This speculation, however, is not yet supported by observation.

† As to the frequency of this complication during the civil war, see pp. 288, 403 and 496, *supra*.

‡ See, for example, on the temperature in dysentery, pp. 348 and 351, *supra*.

§ RANKE—*Beobachtungen und Versuche über die Ausscheidung der Harnsäure beim Menschen*, &c., Munich, 1858, S. 36—found that quinia produced considerable diminution in the quantity of uric acid eliminated; and this has been confirmed by KERNER—Jahrg. III, S. 97 *et seq.*, *op. cit.*, note *, *supra*—who has gone still further, and with great care measured in his own urine the variations in the quantity of the various nitrogenous excreta under the influence of quinia. His analyses took into account the urea, uric acid, creatinin, &c., separately as well as the total nitrogen-content of the urine. I must refer to his paper for details, but cite the following general results: Daily quantity of nitrogen excreted during the 1st, 2d and 3d days of the experiment, without quinia, 19.362 grammes; during the 4th, 5th and 6th days, still without quinia, 17.306 grammes; during the 7th, 8th and 9th days, under the influence of small repeated doses (.075 gramme eight times a day) of muriate of quinia, 16.170 grammes; during the 10th, 11th and 12th days, under the influence of a large dose (1 to 2.5 grammes) of muriate of quinia taken daily, 13.979 grammes. Then stopping the quinia during the 13th, 14th and 15th days, the mean daily excretion of nitrogen was 17.014 grammes, and during the 16th, 17th and 18th days, 19.070 grammes. The diet remained substantially uniform throughout the experiment. The greatest diminution in the nitrogen-excretion occurred on the 12th day, on which he took 2.5 grammes of quinia and passed only 12.73 grammes of nitrogen. ZUNTZ is stated by STRASSBURG—S. 343, *op. cit.*, *infra*—to have obtained on himself equally striking results. A comparison of three normal days with four under the influence of quinia in doses of 1.8 grammes showed a diminution of about 39 per cent. H. v. BOECK—*Untersuchungen über die Zersetzung des Eiweisses im Thierkörper unter dem Einflusse von Morphium, Chinin und arseniger Säure*, Munich, 1871, S. 31—experimented on dogs, and observed, under the influence of quinia, a greater diminution in the excretion of nitrogen than was produced by morphia: arsenic acid produced no such diminution. On the other hand, RABUTEAU—*Le sulfate de quinine ne diminue pas l'urée*, Comptes rendus de la Soc. de Biologie, T. V, 1868, p. 92—concluded, from experiments on himself and on dogs, that the elimination of urea is not diminished by quinia, although in the case of dogs the administration of arsenite of potassium was followed by a considerable diminution; and E. UNRUH—*Ueber die Stickstoffausscheidung bei fieberhaften Krankheiten*, Virchow's Archiv, Bd. XLVIII, 1869, S. 227—after ascertaining that in ileotyphus, erysipelas, pneu-

increase our confidence in the powers of the drug as a tonic and supporting remedy, but further investigations are needed.

Yet another point earnestly urged of late is the alleged power of quinia as an antiphlogistic. The observation of Binz, since often corroborated, that the addition of about one-four-thousandth part of this alkaloid to a drop of recently drawn blood inhibits the amœboid movements of the white corpuscles, led to a series of experiments by that observer and his disciples which seemed to show that by the administration of quinia the experimental development of inflammation could be prevented, and the course of inflammations previously excited beneficially modified. But contradictory observations have been brought forward by others, especially by Hayem, Bochefontaine and Köhler, who have succeeded in producing inflammation in frogs profoundly under the influence of quinia.* It cannot, therefore, be admitted that the antiphlogistic virtues ascribed to the drug have been fairly established by experimental evidence. Meanwhile it has been pretty freely administered in pneumonia and other internal inflammations, and with a certain degree of advantage, as indeed might have been expected from its power of diminishing febrile temperatures;† but no more by clinical observation than by experiment has it been demonstrated to exert any such antiphlogistic influence as would warrant its employment in the fluxes, unless it is indicated by other considerations than the mere existence of intestinal inflammation.

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monia and other feverish diseases the total nitrogen-excretion was increased in the mean to about one-fifth more than the normal, (in a state of hunger,) found that the administration of sulphate of quinia sometimes diminished this result in a marked manner; but in other cases had no effect or was followed by an actual increase. In connection with the foregoing observations it must be mentioned that H. v. BŒCK and J. BAUER—*Ueber den Einfluss einiger Arzneimittel auf den Gasaustausch bei Thieren*, Zeitschrift für Biologie, Bd. X, 1874, S. 360—found that the action of quinia produced in man a little diminution in the amount of carbonic acid excreted by the lungs. Similar effects were produced on animals by small doses, but large doses produced convulsions, and then the carbonic-acid excretion was greatly increased. G. STRASSBURG—*Ueber die Ausscheidung der Kohlensäure nach Aufnahme von Chinin*, Archiv für experiment. Path. und Pharm., Bd. II, 1874, S. 341—experimented on rabbits, and found that in healthy animals quinia produced no diminution of the carbonic acid exhaled. In the case also of rabbits in which fever had been previously developed, it produced no marked effect. Taken altogether, the foregoing testimony seems to render it probable that one of the effects of quinia both in health and disease is to diminish tissue-metamorphosis, though further observations are needed to reconcile discrepancies. It is not, however, surprising that, as UNRUH'S observations show, the drug should sometimes fail to arrest the destructive processes in progress during grave febrile disorders. The following observations may stand related to the diminished tissue-metamorphosis possessed by quinia: When blood is allowed to putrefy out of the body it speedily diminishes in alkalescence in consequence of the formation of an acid, a process which has been studied especially by N. ZUNTZ—*Beiträge zur Physiologie des Blutes*, Inaug.-Diss., Bonn, 1868, S. 19 *et seq.* A. SCHULTE—*Ueber den Einfluss des Chinin auf einen Oxydationsprocess im Blute*, Bonner Inaug.-Diss.; I cite from the abstract in Centralblatt für die med. Wiss., Jahrg. IX, 1871, S. 727—found, as had previously been done by SCHARRENBROICH and ZUNTZ, that this process is hindered by quinia. Similar results have been obtained by BINZ—*Ueber Chinin und Blut*, Archiv für experiment. Path. und Pharm., Bd. I, 1873, S. 18—who regards it as indicating that quinia retards the process of oxidation in the blood. BINZ has also shown—*op. cit.*, S. 23 *et seq.*—that the addition of quinia interferes with the power of the blood to act as a carrier of ozone from ozonized oil of turpentine to tincture of the resin of guaiac or sulphate of indigo. He also observed that the blood of young cats that had received large but not fatal doses of quinia acted less than normal blood upon a tincture of guaiac.

* I refrain from a detailed discussion of this controversy. The following are the most important papers: C. BINZ—*Ueber die Einwirkung des Chinin auf Protoplasma-Bewegungen*, Archiv für mikroskop. Anat., Bd. III, 1867, S. 383; *Experimentelle Untersuchungen über das Wesen der Chininwirkung*. Berlin, 1868, S. 29; *Quinine and the colourless blood-corpuscles*, The Practitioner, Vol. IX, 1872, p. 141; as well as S. 137 *et seq.*, *op. cit.*, note *, last page. In support, more or less completely, of the view of BINZ, may be mentioned C. SCHARRENBROICH—*Das Chinin als Antiphlogisticum*, Inaug.-Diss., Bonn, 1867, and Berliner Klin. Wochenschrift, Jahrg. IX, 1872, S. 190; A. MARTIN—*Das Chinin als Antiphlogisticum*, Inaug.-Diss., Giessen, 1868; G. KERNER—*Ueber den Einfluss des krystallinischen und des amorphen Chinins auf die weissen Blutzellen und den Eiterbildungsprocess*, Pflüger's Archiv, Bd. VII, 1873, S. 122, and The Practitioner, Vol. X, 1873, p. 169; E. B. BAXTER—*The action of the cinchona alkaloids and some of their congeners on bacteria and colourless blood-corpuscles*, same Jour., Vol. XI, 1873, p. 321; and N. JERUSALIMSKY—S. 71, *op. cit.*, p. 800, *supra*. On the other hand, C. SCHWALBE—*Ueber die entzündungswidrige Wirkung des Chinin*, Deutsche Klinik, Bd. XX, 1868, S. 325—killed cats by the subcutaneous injection of poisonous doses of quinia, and, examining their blood immediately after death, was able still to recognize the amœboid movement, although only imperfectly, as he had no hot stage: (the experiments were performed in Costa Rica.) GELTOWSKY—*On the action of quinine on the colourless blood-corpuscles*, The Practitioner, Vol. VIII, 1872, p. 321—found that in the blood of frogs to which even a poisonous dose of quinia was administered subcutaneously, and of Guinea pigs into whose veins even a poisonous dose was injected, the amœboid movement continued unchecked. BOCHEFONTAINE—*Note sur quelques expériences relatives à l'action de la quinine sur les vibrioniens et sur les mouvements amiboïdes*, Archives de Physiologie, T. V, 1873, p. 389 *et seq.*—states—p. 731—that HAYEM in 1868 attempted in VULPIAN'S laboratory to repeat some of the experiments of BINZ. Two frogs were curarized: one of them was also intoxicated with chlorohydrate of quinia; the mesentery of each was drawn into the air, and the amœboid wandering of the leucocytes was equally observed in both. BOCHEFONTAINE in 1873 repeated this experiment, with the modification that the mesentery was irritated with nitrate of silver, and obtained the same results. F. W. ZAHN—*Zur Lehre von der Entzündung und Eiterung*, Inaug.-Diss., Berne, 1871—came to the conclusion—S. 52—that the internal or subcutaneous administration of quinia hindered or diminished the migration of white corpuscles only when fatal disturbances of the circulation were first induced by it; and KÖHLER—*Ueber die Wirkungen des Chinin*, Bericht über die Sitzungen der naturforschenden Gesellschaft zu Halle im Jahre 1876, S. 22—who appears to have acted on this hint, on selecting from frogs in deep quinia narcosis those in whose webs the circulation appeared undisturbed, succeeded in developing in them inflammation of the mesentery, tongue or cornea, with abundant migration of white corpuscles. As for the observations of MANASSEÏN—*Ueber die Dimensionen der rothen Blutkörperchen unter verschiedenen Verhältnissen*, Berlin, 1872, which I have not been able to see, and cite from BINZ, S. 18, *op. cit.*, last note—that in fever the red blood corpuscles are diminished in size and regain their normal dimensions if the animal be brought under the influence of quinia, I must refrain from forming an opinion till I can read his paper, but meanwhile can see no connection between the phenomena, if correctly observed, and any of the therapeutic effects of the drug.

† See, in illustration, the papers of HAGENBACH and RAYMUND, as well as the report of the Committee of the Clinical Society, cited p. 800, *supra*.

Finally, and also under the leadership of Binz, considerable attention has been recently directed to the antiseptic influence of quinia. The belief, that by the administration of Peruvian bark it is possible to arrest the tendency to putridity of the humors in malignant fevers, was very general during the early part of the last century, and Pringle attempted to support it by a series of experiments published in 1750.* The speculation of Binz is merely a revival of this old view, which reappears with the support of an imposing parade of experiments conducted after modern methods. It is shown that a solution of quinia will retard or prevent the putrefaction of flesh, albumen, milk, urine and other organic substances. It is shown that this solution kills bacteria and other low forms of life, which are assumed to be the actual cause of the putrefactive process. It is still further assumed that the presence of certain varieties of these humble living forms in the blood is the cause of the so-called septic processes in disease, that quinia pursues them into the torrent of the circulation, kills them there, and thus cures.†

But much remains to be done before any one of these assumptions can be admitted to rest upon a solid basis of demonstration. Considerable difference of opinion exists even with regard to the comparatively simple question of the strength of the quinia solution necessary to kill bacteria out of the body. Calculating from the proportion he found necessary to kill the bacteria of putrid blood, Bochefontaine asserts that, if forms of similar vitality in the circulating blood are imagined to be the cause of septic fevers, it would be necessary to introduce no less than seventeen grammes of the chlorohydrate of quinia into the blood of an adult to kill them; and the same observer has found that in living frogs intoxicated with quinia it is quite as easy to cause the development of bacteria in the blood (bactérihémie) as in those to which no quinia has been given.‡

Meanwhile, during the progress of the controversy on this doubtful point, there have not been wanting those who have regarded the antiseptic virtues of quinia as at least sufficiently probable to warrant a renewed trial of its efficacy in pyæmia and other septic

* These experiments are contained in a series of papers entitled *Experiments and observations upon septic and antiseptic substances*, read to the Royal Society during the year 1750, Philosophical Trans. abridged, Vol. X, 1756, p. 1365: they are reprinted in full in the first edition of his *Obs. on the Dis. of the Army*, London, 1752, and all subsequent editions. He found that pieces of meat immersed in a strong infusion of chamomile flowers, Virginia snakeroot or Peruvian bark did not putrefy under conditions which were attended by rapid putrefaction if they were immersed in simple water—Exp. viii, p. 374, and Exp. xi, p. 378. Indeed, pepper, ginger, saffron, galls, mint, green tea, red roses and several other vegetable substances seemed to produce a similar antiseptic effect. I note that he thought this power of the bark "perhaps less than of the snake-root or chamomile flowers." In Exp. xiii, p. 381, he was "able to sweeten several small pieces of putrid flesh, by repeated affusions of a strong decoction of the bark;" and "constantly observed, that not only the corrupted smell was removed, but a firmness restored to the fibres." He boldly applied these observations to the interpretation of the operation of Peruvian bark in disease: "Now, since the bark parted with so much of its virtue in water, it was natural to think it would still yield more in the body, when opened by the saliva and bile; and therefore, that it was by this antiseptic virtue it chiefly operated. From this principle we might account for its success in gangrenes, and in the low state of malignant fevers, when the humours are so evidently putrid. And for intermitting fevers, in which the bark is most specific, were we to judge of their nature from circumstances attending them in climates and seasons most liable to the distemper, we should assign putrefaction as a principal cause."

† BINZ: see his memoirs cited in note *, p. 802, *supra*, also *Weitere Studien über Chinin*, Berliner klin. Wochenschrift, Jahrg. VIII, 1871, S. 564 *et seq.*; also the memoir of E. B. BAXTER, cited in the same note. BAXTER experimented also, as BINZ had previously done, (Virchow's Archiv, Bd. XLVI, 1869, S. 129,) with other alkaloids of bark and with the sulphate of beberia. He concludes that quinia and quinidine possess equal antiseptic power; "next comes cinchonidine; last, though at no great distance, cinchonia"—p. 343, *op. cit.*—and that sulphate of beberia approaches and rivals the cinchona alkaloids in antiseptic power—p. 335.

‡ BOCHEFONTAINE—*op. cit.*, note *, last page—arrived at quite different results from those reported by BINZ as to the strength of the quinia solution necessary to kill bacteria and vibrios. For the estimate in the text, see p. 405, *op. cit.* Furthermore, he dropped three or four drops of fresh blood into a solution of one part of chlorohydrate of quinia to 1,000 parts of water, and observed that bacteria were developed by the end of forty-eight hours. In four or five days the solution contained "populations of bacteria, vibrios and spirilla." Finally he made use of an experiment of VULPIAN to develop bacteria in the blood of living frogs, (bactérihémie.) If a small quantity of cyclamine (the active principle of the root of cyclamen Europæum, see U. S. Dispensatory, 12th Ed., 1865, p. 1508) be introduced beneath the skin of a frog, a local inflammatory (septic) process is developed, bacteria form in the blood in great numbers, and death ensues in a few days. Now a drop of a solution containing $\frac{1}{1000}$th part of the blood of such a frog will transmit the bacterian infection of the blood (bactérihémie) to healthy frogs, or, as BOCHEFONTAINE found also, to frogs intoxicated with quinia. He found further that the administration of intoxicating doses of quinia to bacterihemic frogs in no wise affected the bacteria. He concluded, therefore: "Chez les grenouilles en état de bactérihémie, l'intoxication par la quinine ne détruit pas les bactéries ou les vibrions;" and that, "La bactérihémie expérimentale paraît se développer également chez les grenouilles intoxiquées par la quinine et chez les grenouilles qui ne le sont pas"—p. 733. For an account of the mode of experimenting with cyclamine, referred to in this note, see A. VULPIAN—*Développement de vibrions pendant la vie, dans le sang des grenouilles empoisonnées par la cyclamine.—Intoxication de grenouilles saines par inoculation du sang des grenouilles ainsi empoisonnées*, Archives de Physiologie, T. I, 1868, p. 466.

diseases;* I say a renewed trial, for its use in these affections is no new thing. But its other better established powers are sufficient to account for the degree of success which has long attended it, and these recent trials, like the older ones, have failed quite often enough to discredit the speculation that the drug acts as a parasiticide capable of slaying the living cause of the disease. In like manner some of those who believe that bacteria cause the fluxes have brought it into use as an antiseptic in these diseases also.† The experiments which have been published are as yet too few to warrant any very positive conclusions, but I confess I see no reason to anticipate ultimate success in this direction.‡

It is not necessary to say much here in regard to the proper doses of quinia, the subject being now in most quarters well understood. Broken doses amounting to from three to ten grains daily are generally sufficient when the tonic or supporting influence of the drug is desired; but when the object is to lower the temperature in febrile conditions, or to cut short the progress of malarial fevers, from twenty to thirty grains given in a single dose, or at least within an hour, are usually required, and in severe cases a still larger quantity, forty to sixty grains, is often necessary. These large doses had been previously employed by a few physicians, as Bally (1830) in France, Fearn (1836) and May (1837) in the southern United States;§ but it was chiefly in consequence of the successful experience of the medical officers of the United States Army,‖ who used it on a large scale during the Florida

* See, for example, the discussion on the address of P. G. HEWETT—*On pyæmia in private practice*, Trans. of the Clinical Society of London, Vol. VII, 1874, p. li *et seq.*, and The Lancet, 1874, Vol. I, p. 337 *et seq.*—especially the statements of DURHAM—p. xcv *et seq.*—as to the effects of quinia, in half-drachm doses repeated every three or four hours, observed by himself in hospital practice, and those of GORDON—p. cii *et seq.*—as to his observations of the practice of the French surgeons during the siege of Paris. He tells us that "There were several kinds of treatment employed. One was—and I believe it is that which was adopted most frequently—the administration of very large doses of quinine;" and also, "that the recoveries are recorded as being not by any means unfrequent"—p. civ.

† Thus, for example, WM. JOHNSTON—*Summer diarrhœa: its nature, cause, and treatment*, The Lancet, 1878, Vol. II, pp. 397 and 433—has arrived at the conclusions that "(a) diarrhœa, as it affects both adults and infants during the summer months, owes its origin, in the great majority of instances, to the introduction of minute living organisms (bacteria) into the system by means of air or in food; and (b) the disease depends upon putrefactive changes in the bowel contents, which changes are correlative to the development and multiplication of these microscopical organisms." Of course he thinks the treatment should consist in giving antiseptics, such as "carbolic acid, quinine, salicylic acid, the mineral acids (especially the dilute sulphuric), thymol, benzoic acid, and borax"—p. 434.

‡ It is not necessary to the purpose here in view to discuss the imperfect observations hitherto made with regard to the influence of quinia upon the nervous system. The following are the most important papers: A. EULENBURG und T. SIMON—*Ueber die Wirkungen des schwefelsauren Chinins auf das Nervensystem*, Berliner klin. Wochenschrift, Jahrg. I, 1864, S. 48, and Archiv für Anat. Physiolog. und wiss. Med., Jahrg. 1865, S. 423; T. A. CHÁPERON—*Beitrag zur Kenntniss der physiologischen Wirkung des Chinin*, Inaug.-Diss., Würzburg, 1869; H. HEUBACH—*Einwirkungen des Chinins auf das Nervensystem*, Centralblatt für die med. Wiss., Jahrg. XII, 1874, S. 673; and *Beiträge zur Pharmakodynamik des Chinins*, Archiv für experiment. Path. u. Pharm., Bd. V, 1876, S. 1; C. v. SCHROFF, jun.—*Beitrag zur Kenntniss der Chininwirkung*, Stricker's Med. Jahrb., Jahrg. 1875, S. 175. I think it must be admitted, as stated by BUCHHEIM—S. 436, *op. cit.*, p. 746, *supra*—that the effects of medicinal doses upon the nervous system are not clearly made out. As for the speculation of H. BENCE JONES—*Lectures on some of the applications of chemistry and mechanics to pathology and therapeutics*, London, 1867, p. 28 *et seq.*—that quinia acts by replacing a fluorescent substance normally contained in the blood and other fluids of the body, which is deficient in malarial fevers, &c., I attach no particular importance to it in the present state of our knowledge. The reader may consult on this subject the corroborative observations of E. RHOADS and W. PEPPER—*A contribution toward our knowledge of the pathological changes in the fluorescence of the tissues*, Pennsylvania Hospital Reports, Vol. I, 1868, p. 269; and the abstract of the observations of CHALVET—*Note sur la prétendue quinoïdine animale de Bence Jones*, Gaz. Hebdom., T. V, 1868, p. 289—which seem to show that the so-called normal fluorescence is dependent upon the ingestion of fluorescent vegetable matters present in a variety of articles of diet.

§ BALLY—*Du sulfate de quinine à haute dose*, La Lancette Française, T. IV, 1830, p. 91—gave it with success at the Hôtel-Dieu to cases of intermittent fevers in the dose of 30, 40 and even 60 grains. THOMAS FEARN—*On sulphate of quinine in large doses*, The Transylvania Jour. of Med., Lexington, Ky., Vol. IX, 1836, p. 705—states that he had been in the habit of giving in remittent fever three doses of twenty grains each with an interval of an hour between, and reports a case in which 96 grains were given successfully: the patient became temporarily "almost blind." Indeed, this author mentions that "in two or three instances blindness, or obscurity or confusion of vision" occurred temporarily after his usual doses. J. E. MAY—*On the remedial use of sulphate of quinine in large doses*, same Jour., Vol. X, 1837, p. 217—relates FEARN's case and several others, and thinks the dose "should be regulated by the strength, or vital energy of the patient. If there be much prostration and torpor of the general system, mammoth doses."

‖ An account of this interesting question will be found in the first *Statistical Report* of COOLIDGE—p. 637, *op. cit.*, p. 416, *supra*—who has collected and republished the original official documents relating to it. He prudently writes: "Without attempting to decide upon the *originality* of this practice, in *any of its phases*, or to determine to whom, among the medical officers, is due the merit of introducing it into the army, (for on this point the official records are silent,) it may with truth be said, that to the medical staff of the army belongs the credit of having demonstrated, on an extensive scale, its safety and efficacy, and of having thereby largely contributed to revolutionize the treatment of fever in this country. It has not been practicable to ascertain from the official records the *precise time* of the introduction into the army of the practice of giving quinine in large doses. The earliest reports of sick, in which that practice is alluded to, refer to the treatment as having been adopted some time previously. The reports of Assistant Surgeon (now Surgeon) J. J. B. Wright, for the quarter ending June 30, 1841, and of Assistant Surgeon (now Surgeon) Charles McCormick, for the quarter ending September 30, 1841, are the first which are accompanied with any special or detailed account of this treatment." To which I may add that Surgeon WRIGHT expressly states that he adopted the plan in 1841 at the suggestion of Surgeons B. F. HARNEY and B. RANDALL. And from the reports of these officers it appears that HARNEY first employed them in 1838—see p. 648—and RANDALL in 1840—see p. 649. MCCORMICK is ambiguous on this head, but in his report, dated October 11, 1841—see p. 638—he states that two years previously he abandoned quinia on account of its inefficiency in ordinary doses, and commenced using the large doses at some unspecified subsequent period.

war, that the safety and efficiency of the method was established. When it is desired to combine the tonic action of quinia with the effect of iron upon the blood the *citrate of quinia and iron* is an eligible preparation, which was employed on a large scale with good results during the civil war;* five to ten grains may be given three times daily.

As for the other alkaloids of Peruvian bark, especially *cinchonia*, it has generally been held that their action, although feebler, is essentially similar to that of quinia.† A large quantity of sulphate of cinchonia was issued during the civil war and used as a substitute for quinia.‡ Some of the medical officers with whom I have conversed state that it often irritated the stomach and caused headache, and all regarded it as less efficacious than quinia; but I heard no such complaints as might have been anticipated, were it true, as has recently been advanced by Dupuis and Laborde, that cinchonia and cinchonidia are endowed with poisonous properties, and exhibit such a tendency to produce convulsions as should exclude their therapeutic use;§ yet the experiments by which this conclusion is supported appear to have been made with care, so that further inquiry is exceedingly desirable.

In this place allusion may also be made to the *bark of the willow*, (salix alba,) which was brought into use in dysentery during the latter part of the last century by Van Geuns, who regarded it as possessed of antiseptic virtues superior even to those of Peruvian bark.‖ Its active principle, *salicin*, after pretty generally recognized failure as a substitute for quinia,¶ has recently been essayed as a remedy for diarrhœa by Lawson and others.** Undoubtedly it possesses tonic properties, but it may well be questioned whether it is really more useful in the fluxes than the other vegetable bitters.

More considerable importance attaches to the employment of *nux vomica* and its alkaloid *strychnia*.†† Nux vomica was first used for the treatment of dysentery in the

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* See note †, p. 800, *supra*, for a statement of the quantity purchased.

† These alkaloids are quinidia, cinchonia and cinchonidia. For an account of them, with references to the literature previous to 1871, I refer the reader especially to the work of the HUSEMANNS—S. 324 *et seq.*, *op. cit.*, p. 766, *supra*. In view of the great cost of quinia, the East India government instituted in 1866 an experimental inquiry into the comparative value of these alkaloids in paroxysmal fevers. These inquiries were made in Bombay and Bengal as well as in Madras, but, so far as I can learn, only the latter were published. I have not been able to see the *Report of the Madras Chinchona Commission*, as printed in Parliamentary Blue Book, No. 432, East India, but find a copy of it in the *Proceedings of Government, Revenue Department*, 18th April 1868, published by the Madras Quarterly Jour. of Med. Sci., 2d Series, Vol. I, 1868-9, p. 192 *et seq.* The Commission conclude: "That ordinary sulphate of quinine, chemically pure sulphate of quinine, and sulphate of quinidine possess equal febrifuge power; that sulphate of chinchonidine is only slightly less efficacious; and that sulphate of chinchonine, though considerably inferior to the other alkaloids, is notwithstanding a valuable remedial agent in fever"—p. 198. An abstract of this report will be found in The Lancet—*The sulphates of the new chinchona alkaloids as substitutes for quinine*—1873, Vol. I, p. 747. See also J. EWART—*Report on the therapeutical value of the cinchona alkaloids*, &c., The Indian Annals of Med. Sci., Vol. XIII, 1869, p. 1—who arrives at substantially the same conclusion, with the additional observation as to cinchonia, that "the irritability of stomach set up by it is *the* great objection to its ever taking rank as a substitute for either of the preceding alkaloids." Compare the abstract of the thesis of J. DOUGALL—*The febrifuge properties of the cinchona alkaloids*, Edinburgh Med. Jour., Vol. XIX, Part I, 1873, p. 193—who comes to the same general conclusions, and adds that quinia requires only from two-thirds to three-quarters the dose to produce the effects of a given quantity of quinidia, the most active of the three baser alkaloids. It is interesting to note how closely the observations of BAXTER—p. 313, *op. cit.*, p. 802, *supra*—on the relative antiseptic power of these alkaloids, agree with the previously announced conclusions of the Cinchona Commission.

‡ See note †, p. 800, *supra*, for a statement of the quantity purchased for issue.

§ DUPUIS et LABORDE—*Étude expérimentale des succédanés de la quinine*, La Tribune Méd., IIme année, 1872, p. 147 *et seq.* These gentlemen found that subcutaneous injections of 75 centigrammes of sulphate or muriate of cinchonia produced epileptiform convulsions in vigorous dogs; cinchonidia produced similar effects. They conclude in forcible language: "Ces substances appartiennent plutôt à la catégorie des substances toxiques que des substances médicamenteuses, et que, par conséquent, la toxicologie les réclame plutôt que la thérapeutique"—p. 210. In this connection I may refer to a statement in New Remedies—*The relative values of cinchonidia and quinia*—September, 1876, p. 271, that the Medical Board of Bellevue Hospital have caused experiments to be instituted as to the use of cinchonidia sulphate, and that while the surgical members found it entirely unsuitable for surgical cases, on account of its tendency to excite emesis, the board regarded it, apparently, as good enough for "purely medical affections."

‖ VAN GEUNS—§ 14, S. 52, *op. cit.*, p. 649, *supra*—indeed appears to have regarded the willow bark as an antiseptic, "ein Fäulnisswidriges Mittel in der Ruhr." He gave it in decoction; see formula 15, S. 365, *op. cit.*

¶ See the article on salicin in the work of the HUSEMANNS—S. 959, *op. cit.*, p. 766, *supra*—for references to the literature of this subject.

** LAWSON—*op. cit.*, note *, p. 773, *supra*—advised the use of 6 to 8 grains of salicin once to thrice daily in cases of summer diarrhœa resulting from the direct action of heat on the nervous system. See also J. B. MATTISON—*The value of salicin in obstinate diarrhœa*, The Med. and Surg. Reporter, Vol. XXVIII, 1873, p. 107—who divides a drachm of salicin into 24 pills, and gives to adults two every four hours; J. C. BISHOP—*Salicine in diarrhœa and dysentery*, The Southern Med. Record, Vol. IV, 1874, p. 585; also *Comparative value of opium and salicine in diarrhœa and dysentery*, Detroit Review of Med. and Pharm., Vol. X, 1875, p. 387; and J. K. SPENDER—*Remedies for chronic diarrhœa*, The British Med. Jour., 1876, Vol. II, p. 750.

†† Nux vomica was unknown to the Greek physicians, and a difference of opinion exists as to whether the Arabians were acquainted with it. ADAMS, in his remarks *On the substances introduced into the materia medica by the Arabians*, appended to Book VII, Sect. III, of his version of PAULUS ÆGINETA, Vol. III, p. 461, *op. cit.*, p. 624, *supra*, argues in favor of the view that the substance, which in the mediæval Latin versions of RHAZES, HALY ABBAS and SERAPION is called nux vomica, and SONTHEIMER in his version of EBN BAITHAR translates strychnos nux vomica, is identical with our

Linköping epidemic, (1772,) by the Swedish physician Hagström. Accepting Nyander's speculation that dysentery is caused by acaridæ, he gave it in scruple doses as a parasiticide, expecting that its well known poisonous effects upon quadrupeds would be readily exerted upon these minute creatures.* The attention of Hufeland was directed to the drug by these observations, and he used it freely, with alleged success, in the Jena epidemic of 1795; but he explained the effects of his treatment by different, though equally erroneous, speculative considerations. He started out with the belief that nux vomica is one of the most powerful narcotic and antispasmodic substances at the disposal of the physician;† and, as so often happens, his great clinical experience only served to strengthen his confidence in this mistaken view. How such an error arose is only too painfully clear to the intelligent medical historian. The European Arabists had confounded the nux methel of the Arabians with nux vomica, and subsequent writers, by a literary error, attributed the narcotic properties of the former to the latter. Copied from one book on therapeutics to another without the check of scientific experiment,‡ it is not strange that Hufeland commenced his trial of

modern nux vomica. RHAZES—*Ad Mansor de re med.*, Lib. VIII, Cap. 49, p. 205, Ed. cited p. 678, *supra*—classes nux vomica with white hellebore and other emetics, and tells what to do if syncope or spasms follow the ingestion of excessive doses. HALY ABBAS—*Practica*, Lib. II, Cap. 55, fol. 182, also Lib. X, Cap. 12, fol. 334, Ed. cited p. 678, *supra*, and SERAPION—*Practica*, Tract. VII, Cap. 36, fol. 112, and *De temp. simp.*, Cap. 163, fol. 145, Venetiis, apud Juntas, 1550—speak of its medicinal use as an emetic; the latter author calls it "Leun alkei, vel alke, id est nux vomica." EBN BAITHAR—Bd. I, S. 270, Ed. cited p. 704, *supra*—calls it Dschawz elkai, which SONTHEIMER translates strychnos nux vomica. He cites several Arabian authorities for its medicinal use as an emetic in two-drachm doses, the dose mentioned by SERAPION, and states that it has been found useful in paralysis and trismus. According to AINSLIE—*Mat. Indica*, London, 1826, Vol. I, p. 319—the tree is a native of Persia, so that it is probable enough the Arabian physicians were acquainted with it. Yet, according to DALE—p. 328, *op. cit.*, p. 729, *supra*—the nux vomica of SERAPION is St. Ignatius bean, (the bean of strychnos Ignatii,) and PEREIRA—Vol. II, p. 533, Ed. cited p. 746, *supra*—adopts this view, suggesting that "it is probable that the nux-mechil of Serapion is the substance which we denominate nux-vomica:" compare SERAPION—*De temp. simp.*, Cap. 164, fol. 145, *op. cit.* The nux methel which AVICENNA—Lib. II, Tract. 2, Cap. 508, Ed. cited p. 632, *supra*—describes as resembling the nux vomica, has also been supposed to be our nux vomica: see note ‡, *infra*. But AVICENNA not merely speaks of it as poisonous, but as stupefying; and elsewhere—Lib. IV, Fen. 6, Tract. 1, Summa 3, Cap. 2, Vol. II, p. 206, *op. cit.*—declares that it produces vertigo, redness of the eyes, intoxication and profound sleep. It is more probable that the nux methel was the fruit of a species of datura: see ADAMS—*loc. cit.* Both STILLÉ—Vol. II, p. 177, *op. cit.*, p. 711, *supra*—and the authors of the *Pharmacographia*—p. 384, *op. cit.*, p. 704, *supra*—express doubts as to whether any of the Arabian passages cited above really refer to our nux vomica. STILLÉ objects that the effects ascribed by the Arabians to their nux vomica are quite different from those actually belonging to that substance: "It is stated to be emetic and purgative, and its dose is given as two drachms; but no allusion is made to its possessing poisonous properties." How, then, about the poisonous properties described by RHAZES—*supra*? And is it really an objection that the Arabians regarded it as an emetic? so did DALE—see note ‡, *infra*—but we know that he had our nux vomica. GESNER and FALLOPPIUS were sure that it was a sudorific; HUFELAND was sure that it was not, but held it, as GESNER, DALE and others had done before him, to be a narcotic—see note ‡, *infra*. Is it possible to conclude anything more from these conflicting views than the uncertain character of clinical experience? Nevertheless, I readily admit that the identity of the Arabian drug is by no means positively established by the testimony in our possession.

* J. O. HAGSTRÖM—*Kön, Om Nucis Vomicæ nytta emot Röd-sot*, Kongl. Vetenskaps Academiens Handlinger, Vol. XXXIV, 1773, p. 301—was sent as commissioner to investigate the epidemic referred to, and succeeded beyond his most sanguine expectations with nux vomica; so much so that, being unable to remain in the afflicted districts, he left behind him, on his return, with clergymen and other prominent persons, considerable quantities of the drug, and in view of the popular prejudice against nux vomica as a poison (how unreasonable these prejudices!) endeavored to secure its more general use by calling it the "American powder," and, afterwards, "sedative powder." J. L. ODHELIUS—*Kön, Om Lepra*, same Trans., Vol. XXXV, 1774, p. 266—who is cited by HUFELAND (see next note) as testifying also to the success of nux vomica, appears only to have given it in one case, in which, a long lumbricoid having been passed, he gave the nux in 15-grain doses, twice daily; the patient died, but of course he explains this was from her own neglect of diet, &c.; otherwise so excellent a medicine would certainly have cured her.

† HUFELAND—S. 108, *op. cit.*, p. 740, *supra:* "Es war mir diess Mittel aus Hagströms Erfahrungen bekannt, der es schon so glücklich gegen die Ruhr gebrauchte. Ich wuste, dass es eines der stärksten krampfstillenden und narcotischen Mittel ist, die wir besitzen," &c.

‡ I cannot better illustrate the manner in which nux methel and nux vomica were confused than by citing the following passage from FALLOPPIUS—*De tumoribus præter naturam*, Cap. XXVII, *De bubone pestifero*, Opera, Frankfort, 1600, T. I, p. 670: "Germani secta vena (secaot enim quandoque) exhibent nucem vomicam, seu medicamentum nucis vomicæ. Notandum, quod nux vomica officinarum est nux methel, nux vero officinarum methel est nux vomica Arabum, qua nuce utimur ad interficiendum canes, et hac utuntur Germani in pestiferis bubonibus, et loquutus sum cum scholaribus Germanis, qui assumserunt hujus nucis scrup. unum, aut scrup. duos, et quandoque usque ad drach. unam. Symptoma quod succedit, est sudor magnus, quibus vero hic sudor accidit, evadunt. Verum ego hanc nucem non exhiberem: quoniam est medicamentum venenosum, et mortiferum." As is well known, this treatise was published posthumously, and the versions differ considerably. Thus, in the Venice edition of the Opera, 1606, T. III, fol. 68, where substantially the same story is told, the dose is not given, and FALLOPPIUS is made to speak less positively against the use of the drug; for although he remarks "apud me est suspectum," yet he concludes, "quare possetis, et vos exhibere tale medicamentum: nam licet vomica nux sit venenum eanum, fortasse erit antidotum respectu hominum: nam multa reperiuntur, quæ sunt venenum uni speciei animalium; alteri vero antidotum." All which is true, no doubt; but, alas, we know too well now that the nux in proper doses kills men as readily as dogs! CONRAD GESNER—*Epist. Med.*, Lib. III, fol. 114, Ed. cited p. 752, *supra*—in an epistle written in 1565, three years after the death of FALLOPPIUS, had classed nux vomica, with opium and solanum somniferum, among the substances which provoke sweat, and are therefore useful in the plague, (contra pestem;) and in 1564—Lib. I, fol. 33—he wrote to ACHILLES P. GASSER that he now certainly knows that nux vomica is narcotic, (nucem vomicam narcoticam esse,) which hitherto he had doubted, for having given half a scruple to a dog, after half an hour it slept, and died within four hours, and that sometimes its head, sometimes its legs were convulsed during sleep. DALE—p. 327, *op. cit.*, p. 729, *supra*—gives nux metella among the synonyms of nux vomica, and writes of its medical properties: "Narcotica est, virulenta, et opio deterior. Canes, feles, corvos, &c. cum cibo exhibita interimit, vomitumque ciet." MANGETUS—T. II, p. 448, *op. cit.*, p. 736, *supra*—who describes the drug under the head of nux metella, adopts the above citation from DALE, except the remark about vomiting, as to which he says: "Nux vomica perperam vocatur hic fructus cum vomitum non moveat;" and doubts its identity with the nux methel of the Arabians: "Nucem metel Arabum nonnulli eum nuce vomica eundem esse, volunt, verum descriptiones ei non conveniunt." JAMES—Art. *Nux vomica*, T. III, *op. cit.*, p. 690, *supra*—borrows his account chiefly from DALE and MANGETUS; he repeats: "The nux vomica is narcotic, virulent, and even worse than opium." ALSTON—Vol. II, p. 39, *op. cit.*, p.

nux vomica with this belief; but experience with considerable doses, eighteen to thirty grains of the powder, ten to twelve of the extract, daily, did not disabuse his mind in spite of the occasional development of characteristic toxic symptoms in his patients.*

The statements of Hufeland induced others to make trial of nux vomica in dysentery. Berends, Richter, P. L. Müller and Vaux employed it with alleged success; but Hargens in the Kiel epidemic (1798) was much less fortunate, and Schmidtmann in the Melle epidemic (1800) was so unsuccessful that he subsequently ceased to use it, while Rademacher and Horn, although they regarded it as beneficial, were led to administer it usually in combination with opium.† Naumann, in discussing the question, called attention to the poisonous effects of large doses, and counselled caution in the use of the drug; yet even he attributed to it a narcotic power, although he admitted this was not very decided.‡ Hauff tried it in a few cases without success during the Wurtemburg epidemic of 1834, and returned to opium as a more efficient and safer remedy.§ Meanwhile nux vomica had been employed with more or less advantage in certain chronic fluxes by Bucholz, Hufeland, Rummel, Récamier and Frisch;‖ and *strychnia*, first isolated in 1818, had been brought into use in similar cases by Graves (1827) and Bardsley, (1830.)¶

772, *supra*—cites MILLER as saying, "I know of no physical use these nuts are applied to, they being narcotic and poisonous, and only used to destroy cats, dogs, etc." Both he and JAMES regarded them as unfit for medicinal use. HUFELAND may, therefore, well be excused for having imbibed the idea that nux vomica is narcotic; and yet more than a century before he wrote, LOSS—*Diss. de nuce vomica*, Wittenberg, 1683; which I have not been able to see, and quote from MURRAY—T. I. p. 479, *op. cit.*, p. 752, *supra*—from an analysis of the symptoms of poisoned animals, had arrived at the just conclusion that the drug was not truly a narcotic: "Sic igitur verum somnum, instar narcoticorum, non movet, sed insensilitatem sive stuporem." See also the references in MANGETUS, JAMES, ALSTON and MURRAY to the early observations of the symptoms of poisoning by nux vomica in animals and even in man. I may conclude this note by expressing my surprise that so recent a writer as BAMBERGER—S. 417, *op. cit.*, p. 578, *supra*—should still speak of nux vomica as a narcotic: "Von den übrigen Narcoticis ist besonders die Nux Vomica öfters angewendet wordee." VOGT—S. 201, *op. cit.*, p. 645, *supra*—on the other hand, wisely remarks: "Es ist * * * aber durchaus kein Narcoticum in gewöhnlichen Sinne."

* HUFELAND—*op. cit.*, note †, last page. Note the symptoms described on S. 125. A woman took six grains of the extract, and six hours later three more: "Sie bekam hierauf eine ausnehmende Schwäche der Glieder, dass sie sich nicht auf den Beinen halten konnte, allgemeines Zittern, Schwindel, Betäubung des Kopfs, Aengstlichkeit, und einen kleinen aussetzenden Puls." Such symptoms must have been far from uncommon in his experience, for he boasts: "Ich weiss Personen, die binnen 24 Stunden 10 ja 12 Gran [of the extract] in getheilten Dosen verzehrten, ehe sie Schwindelanfälle bemerkten"—S. 128. And yet with all this experience he could write: "Die Hauptkraft dieses Mittels ist die narcotische; es nimmt eben so schnell Schmerzen und Krämpfe weg, als Opium und die besten andern Narcotica"—S. 124. I note also as interesting that, contrary to GESNER and FALLOPPIUS, he did not think nux vomica sudorific, and substituted or combined opium when he wished to act upon the skin—S. 127.

† BERENDS, as cited by NAUMANN—Bd. IV, Abth. 2, S. 88, *op. cit.*, p. 645, *supra*; RICHTER—Bd. II, (1821,) S. 133, *op. cit.*, p. 777, *supra*; P. L. MÜLLER—*Med.-chir. Beob.*, Hufeland's Jour., Supplement—Stück des Jahrg. 1825, S. 39, and Neue Jahrb. der teutschen Med. u. Chir., Bd. XII, St. 3, 1826, S. 28; G. VAUX of Ipswich, is stated by J. ARMSTRONG—*Lectures on acute and chronic diseases*, (1834.) I cite the Amer. Ed., Philadelphia, 1837, p. 338—to have employed nux vomica with great success in dysentery during sixteen years, and in about two hundred cases: "It neither purges nor constipates, but removes the inflammation, and healthy evacuations follow." HARGENS—S. 134, *op. cit.*, p. 770, *supra*—expresses his disappointment with its effects, in most of the acute cases in which he tried it, in decided terms. It even seemed sometimes to increase the tormina; yet it was occasionally serviceable in cases in which opium was not well borne, and in the later stages of the disease when it began to assume the characters of lientery. L. J. SCHMIDTMANN—*Summa Obs. Med.*, Berlin, Vol. I, 1819, p. 201—states that it did not respond to his expectations, although "conscious that the intestines of the Westphalians are endowed with a less degree of sensibility than those of the Saxons," he augmented the dose to 2 or 2½ grains of the extract every two hours; it seemed to control the tormina, but often increased the tenesmus. In subsequent years, therefore—p. 202, note—he relied instead on opium, which never deceived him. RADEMACHER—p. 210 *et seq.*, *op. cit.*, p. 731, *supra*—tried nux vomica in dysentery, as SCHMIDTMANN had done, on the authority of HUFELAND. He evidently hesitated to use it, for he wrote: "Ut vero difficile est insuetis armis pugnare, ita molestum, novum adhibere pharmacum, præsertim cum morbus est periculosus." He came, however, after some trial, to the conclusion that it was a useful remedy; but fifteen grains of the extract did not suffice to check the dysenteric discharges sufficiently, and therefore he added to this quantity fifteen drops of the tincture of opium. This combination speedily cured all the cases on which he tried it: "Hoc modo omnes meam opem imploranles paucis diebus sanavi"—p. 215. E. HORN—*Etwas über die diesjährige Ruhr*, Horn's Archiv, Bd. II, Jahrg. 1811, S. 245: "Auch in diesem Herbste sind die wiederholten Versuche über die Wirksamkeit der Krähenaugen günstig ausgefallen, auch diesmal hat es sich gezeigt, dass die Verbindung dieses Mittels mit Opium in einigen Fällen entschieden nützte, wo das Opium allein, selbst in grössern Gaben angewandt, den krankhaften Zustand nicht merklich weiter zu bringen schien."

‡ NAUMANN—*loc. cit.*, last note: "Nach grösseren Gaben derselben hat man starken Ekel, mit Schwindel und heftigem Durst, Erbrechen, Verstopfung, oder reichliche blutige Ausleerungen, zuletzt Convulsionen und Lähmung beobachtet; indessen besitzen sie eigentlich narkotisirende Wirkungen nur in geringem Grade." He thought it should only be tried in the later stages of dysentery, and that perhaps it might be especially suitable in epidemics complicated with intermittent fever.

§ HAUFF—S. 412, *op. cit.*, p. 534, *supra*.

‖ BUCHOLZ, cited by HUFELAND—S. 109, *op. cit.*, note †, last page—who mentions that he himself had done the same. L. RUMMEL—*Der Fluxus cœliacus oder die Milchruhr*, Hufeland's Jour., Bd. LX, St. 6, 1825, S. 33. RÉCAMIER, as cited by A. RICHARD—*Élémens d'Hist. Nat. Méd.*, Paris, 1831, T. II, p. 148. FRISCH, as cited by A. T. THOMSON—*Elements of Mat. Med. and Ther.*; I quote from the 2d Ed., London, 1835, p. 192.

¶ PELLETIER et CAVENTOU—*Mémoire sur un nouvel alcali végétal (la strychnine) trouvé dans la fève de Saint-Ignace, la noix vomique*, &c., Annales de Chim. et de Phys., T. X, 1819, p. 142. R. J. GRAVES—*Clinical observations*, Dublin Hospital Reports, Vol. IV, 1827, p. 40. He used it on the strength of RUMMEL's experience with extract of nux vomica, in the dose of ½th of a grain twice daily, in a case of "whitish stools" following dysentery; the patient recovered in about three weeks. This case is referred to in his *Clinical lectures*, Vol. II, p. 218, Ed. cited p. 778, *supra*. J. L. BARDSLEY—*Hospital facts and obs.*, London, 1830, p. 42 *et seq.*—reports six cases of chronic diarrhœa successfully treated with ½th of a grain of strychnia twice or thrice daily. He remarks: "I do not consider the strychnia a suitable remedy in those instances of diarrhœa, which depend upon an evident inflammatory condition of the mucous membrane of the intestines, but I more particularly recommend it in cases of a *chronic kind*, occurring in persons somewhat advanced in life, and of feeble constitution"—p. 49.

In 1834, Geddings of Baltimore, Maryland, revived the method of Vaux, and used strychnia also in the treatment of dysentery; he employed these remedies especially in cases verging upon a chronic form, and with alleged success.* Cornell, in 1849, during a local outbreak of dysentery, resorted to the same measures, but did not hesitate to use them during the acute stage.† Both these physicians were led by their observations to prefer the powdered nux vomica to strychnia. During the last twenty years, however, neither of these substances has been prescribed to any extent in the acute stages of dysentery, though their employment in the later periods of the disease and in the chronic fluxes has continued to find favor. Some have preferred the powdered nux vomica or its alcoholic extract for this purpose;‡ but these more bulky and less certain preparations have been very generally replaced by strychnia in recent practice.§

During our civil war strychnia was administered quite extensively, by several of the medical officers, in the chronic fluxes. Heroic doses, given apparently with a view to some imagined specific action, were ventured upon by at least one physician; but for the most part the alkaloid was given in tonic doses, and often in combination with quinia or iron, or both. Used in this way, the majority of those who employed it appear to have obtained beneficial results in suitable cases, but a few report that they were disappointed, probably because they expected too much.‖

Undoubtedly strychnia is, next to quinia, the most valuable of the tonics that can be employed in those cases of flux in which the use of tonics is indicated; but modern knowledge of its physiological action, as well as clinical experience, would seem to establish that

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* E. GEDDINGS—*Note on dysentery, and the employment of nux vomica and its preparations in the treatment of that disease*, North American Archives of Med. and Surg. Sci., Vol. I, 1834–5, p. 123. His cases were observed at the Baltimore Infirmary during the fall of 1834. He commenced "by administering the nux vomica in powder, in doses of seven grains, three times a day, as recommended by Vaux of Ipswich, England." He also tried the alcoholic extract in 2-grain doses, thrice daily, and "strychnia, given in form of an acetate, in doses of one twelfth to one sixth of a grain, formed by dissolving the strychnia in acetic acid." He was, however, "inclined to prefer the powder, and next to that the extract," rather than the alkaloid—p. 127. He remarks: "To expect it to perform the part of a specific would be an absurdity, nor would it be reasonable to expect much from it in the acute stage of dysentery. But after suitable depletion, and especially, when the disease is verging upon a chronic form, we doubt not it will be found useful"—p. 128.

† W. M. CORNELL—*Ten cases of epidemic dysentery successfully treated with nux vomica*, The Charleston Med. Jour. and Review, Vol. IV, 1849, p. 295. The epidemic referred to occurred at the village of T—— (not otherwise designated) in the fall of 1848. He was induced to try it by reading the account given by ARMSTRONG of the practice of VAUX: "I gave it in the full dose of seven grains, thrice a day, to adults, and from one to three or four grains to children, in proportion to the age. The result was most happy. Not a patient who was treated with this medicine died. It was prescribed in ten cases, within three or four weeks, and all recovered. * * * I tried the strychnine; but on the whole, much preferred the powdered nux to that. * * * The nux was usually continued till it produced its characteristic symptoms, and at this period, and often before, it checked the disease"—p. 297 This paper is cited by G. B. WOOD—Vol. I, p. 723, *op. cit.*, p. 671, *supra*—who, however, prudently remarks: "It should never be used in the acute febrile state of the sthenic form of the disease."

‡ The alcoholic extract has been commended especially by NEVINS—*Employment of nux vomica in the diarrhœa of exhaustion*, The London Med. Gaz., Vol. XLII, 1848, p. 1035—and VOGT—*loc. cit.*, note ‡, p. 806, *supra*. The latter writer regards it chiefly as a tonic.

§ Among those who have preferred strychnia, I may mention, in addition to those already cited in note ¶, last page, JAMES F. DUNCAN—*Clinical lectures. Diarrhœa*, &c., The Dublin Med. Press, Vol. XIX, 1848, p. 274—who especially recommends it in those diarrhœas consecutive to "ordinary dysentery," in which there is "absence or deficiency of bile in the evacuations."

‖ Favorable reports of its employment were published by M. O. HEYDOCK—*Disease in Camp Douglas*, Chicago Med. Examiner, Vol. III, 1862, p. 517; W. C. OTTERSON—*Remedies for camp diarrhœa*, Amer. Med. Times, Vol. VI, 1863, p. 192; BROWER—*loc. cit.*, p. 779, *supra*; KEMPSTER—p. 346, *op. cit.*, p. 493, *supra*; E. H. PETTENGILL—*Case of chronic diarrhœa cured by the use of strychnia*, Trans. of the Vermont Med. Society for the years 1867 and 1868, p. 70; C. W. DAVIS—*Treatment of diarrhœa*, Amer. Med. Times, Vol. VIII, 1864, p. 154; and R. P. KENDALL—*A few remarks upon the use of heroic doses of strychnia in chronic diarrhœa, during the years 1862-63-64-65, in the United States service*, Cincinnati Lancet and Observer, Vol. X, 1867, p. 263. The last named physician ventured to give the alkaloid in the dose of ¼, ⅓ or even ½ grain; in one case even he gave ⅔ grain. The larger doses were never given oftener than once in twenty-four hours. He appears to have expected to observe symptoms of the toxic action of the drug before the flux was benefited, for he writes: "The specific effects of the strychnia did not manifest themselves until half-grain doses were reached;" and again: "In the case where ⅔ were given, the patient had no discharge for twelve hours. The specific effects were quite violent for two hours—commencing in twenty minutes after exhibition." He claimed that "the result was very decidedly good in every case but one." In the tract of STILLÉ—p. 380, *op. cit.*, p. 659, *supra*—strychnia or the tincture of nux vomica is recommended only "if a relaxed atonic condition of the anus exists." I myself—p. 261, *op. cit.*, p. 606, *supra*—classed strychnia with the remedies that "are of value in some of the varieties" of chronic flux, "and have hence been perhaps too recklessly administered in all cases." I expressed the opinion that "in cases accompanied by general muscular relaxation, with loss of appetite, and without marked abdominal pain or tenderness, nux vomica, or some of its preparations, will be found exceedingly useful." See also my remarks on the subject in *Circular No.* 6—p. 126, *op. cit.*, p. 571, *supra*: "Very generally it was combined with quinine, or with quinine and iron, and proved valuable in many atonic and paralytic conditions of the bowels, but was far from being of general availability in the treatment of severe chronic cases." On the other hand, BROWN—p. 81, *supra*—reports that he tried strychnia only to be disappointed; and S. K. TOWLE—*Notes of practice in the U. S. A. general hospital, Baton Rouge, La., during the year* 1863, Boston Med. and Surg. Jour., Vol. LXX, 1864, p. 58—having been induced to make use of it by the reported success of a friend, writes: "But though I thought I saw much improvement in some cases in restoring tone to the enfeebled intestines, yet I was not as well pleased with strychnine as from his reports I hoped I might be."

it is more than a mere tonic.* Its characteristic action upon the nervous system, and the beneficial results which have been obtained from its administration in various paralytic affections, should lead us to anticipate that it would be useful in the treatment of those paralytic conditions of the muscular coat of the intestines which so frequently occur in the advanced stages of dysentery and during the chronic fluxes. I refer not merely to paralytic states of the rectum and sphincter ani, but to those which occur in other parts of the intestine, especially the colon. These local paralyses favor fæcal accumulation in the affected parts, and this in turn gives rise to local irritative and inflammatory processes; periods of constipation alternating with continual recurrences of the flux hence result.

Savignac, who has drawn attention to the utility of nux vomica in the paralysis of the lower extremities that sometimes follows dysentery, has extended its employment also to the class of cases just mentioned.† For this purpose he prefers the powdered nux to its extract or the salts of strychnia, for the reason that, being less soluble, it may be hoped to reach all parts of the alimentary canal and to exercise its beneficial influence directly upon the paralyzed muscular coat. Of this powder he recommends daily from sixty centigrammes to a gramme, which latter quantity should not be exceeded, and he advises that it should be combined with powdered canella. Only in the consecutive paralyses of the limbs does

* Rapidly absorbed into the blood, the administration of strychnia, even in moderate doses, produces an increase of the arterial tension, apparently the consequence of a contraction of the muscular coat of the bloodvessels. At the same time it greatly augments the activity of the reflex actions of the spinal cord, and in sufficient doses produces convulsions and death. It probably exerts no influence on the brain; the coma that sometimes accompanies cases of fatal poisoning being apparently caused by the previous circulatory disturbances. It is somewhat slowly eliminated from the blood by the kidneys, for it can be detected unaltered in the urine several days after the ingestion of a considerable dose. It would occupy too much space to discuss this interesting and important subject in any detail. I refer the reader especially to the works of STILLÉ, Vol. II. p. 178, *op. cit.*, p. 711, *supra*; the HUSEMANNS—p. 376, *op. cit.*, p. 766, *supra*, and p. 505, *op. cit.*, p. 780, *supra*; H. C. WOOD—p. 282, *op. cit.*, p. 675, *supra*; and BUCHHEIM—p. 455, *op. cit.*, p. 727, *supra*—which give good abstracts of the subject, with references to the literature of the physiological action of the drug its toxicology and its therapeutical use in paralytic conditions. Among the more recent investigations into its physiological action, which I have consulted, I may mention especially those of BROWN-SÉQUARD—*Exp. researches applied to physiology and pathology*, New York, 1853, p. 58; KÖLLIKER—S. 239, *op. cit.*, p. 746, *supra*; CLAUDE BERNARD—*Leçons sur les effets des substances toxiques et médicamenteuses*, Paris, 1857, p. 356; MARTIN-MAGRON et BUISSON—*Action comparée de l'extrait de noix vomique et du curare sur l'économie animale*, Jour. de la Physiologie, T. III. 1860, p. 117 *et seq.*; G. VALENTIN—*Versuch einer physiologischen Pathologie der Nerven*, Abth. II, Leipsic, 1864, S. 320; O. SCHULTZEN—*Strychningehalt des Upas tieuté, Uebergang des Strychnins in den Harn*, Archiv für Anat., Physiolog. und wiss. Med., Jahrg. 1864, S. 498; C. HEINEMANN—*Ueber den Einfluss der Strychninvergiftung auf die Bewegungen des Froschherzens*, Virchow's Archiv, Bd. XXXIII, 1865, S. 394; A. I. SPENCE—*On the mode of action of strychnia*, Edinburgh Med. Jour., Vol. XII, Part 1, 1866, p. 44; A. VULPIAN—*Remarques touchant l'action de la strychnine sur les grenouilles*, Archives de Physiologie, T. III, 1870, p. 116; S. MAYER—*Ueber die Einwirkung des Strychnin auf das vasomotorische Nervencentrum*, Stricker's Med. Jahrb., Jahrg. 1872, S. 111; A. FREUSBERG—*Ueber die Wirkung des Strychnins und Bemerkungen über die reflectorische Erregung der Nervencentren*, Archiv für exp. Path. u. Pharm., Bd. III, 1874-5, S. 204 *et seq.*; and F. A. FALCK—*Brucin und Strychnin*, Vierteljahrsschrift für gerichtliche Med., Bd. XXIII, 1875, S. 78.

† When discussing the occurrence of paralysis in connection with dysentery—p. 412, *supra*—I inadvertently omitted to refer to the observations of SAVIGNAC, although I was well acquainted with them. This author—p. 190, *op. cit.*, p. 620, *supra*—under the heading *Paralysies dysentériques*, states that these affections may involve sensation, motion, or both. The most common variety is a paraplegia in which motion only is impaired: recoveries in the course of a few months are frequent, but sometimes it persists. He had observed paralysis of but one lower extremity in several sailors who had suffered with dysentery during the Crimean war, and had observed incomplete paralysis, or at least considerable muscular debility of both lower limbs, in several individuals who had contracted dysentery during the expedition to Mexico; but these latter cases had suffered also from marsh fever, or even yellow fever, one of them from articular rheumatism, so that he was not very sure of the part that dysentery played in the causation of the disease. In a subsequent memoir—*Des paralysies qui accompagnent et suivent la dysenterie et les coliques sèches, et de leur traitement par la noix vomique*, read to the Acad. Imp. de Méd., April 9, 1867, L'Union Médicale, T. III. 1867, p. 200 *et seq.*—these views are elaborated with more detail, and a case is recorded in which the patient, who contracted dysentery in Mexico, suffered from progressive paralysis at first of the lower and afterwards of the upper extremities. The case terminated fatally, and on the autopsy lesions of the spinal cord were observed, the description of which I cite on account of the rarity of similar observations: "Le bulbe rachidien ne présente rien de particulier. Mais des lésions importantes se découvrent dans la mœlle. En effet, le renflement cervical est le siége d'un ramollissement blanc, sans injection sanguine, constituant la matière qui le forme en état de diffluence légère. Au-dessus et au-dessous du renflement cervical, dont les émergences nerveuses ne participent pas au ramollissement, le cordon rachidien offre son aspect et sa consistance ordinaires. Dans le renflement lombaire ou crural, ramollissement bien plus considérable encore; en cet endroit la mœlle, après incision de ses enveloppes, se montre en pleine diffluence, blanche, sans mélange de sang: Ce ramollissement se propage, quoiqu' à un moindre degré, un peu au-dessus du renflement lombaire, et beaucoup au-dessous, en intéressant jusqu' aux nerfs terminaux formant le faisceau dit *queue de cheval*." In another case of dysentery, in which paralysis of the lower limbs preceded death, SAVIGNAC found "au niveau du renflement lombaire, non pas, à vrai dire, un ramollissement, mais néanmoins plus de molliesse que dans le reste du cordon rachidien;" and also "une assez forte injection sanguine de ce renflement lombaire." I leave it to my readers to judge just how much these observations are probably worth, remarking only that no histological investigation appears to have been undertaken, and that the time that elapsed between death and the autopsies is not recorded. For his account of his later experience with nux vomica in chronic fluxes and his views as to its mode of operation, see p. 241 *et seq.* In his earlier work—p. 390, *op. cit.*, p. 620, *supra*—he stated that he had not yet made any very conclusive observation on the subject. As to his preference for nux vomica rather than strychnia, I must confess he appears to me to base it on exceedingly illogical grounds. If his speculation "sur l'origine rachidienne et la nature paralytique de la dysentérie" had, even in his own mind, any substantial basis, he would surely expect to reach the diseased spinal cord more speedily and effectually by the soluble and active sulphate or acetate of strychnia than by the powdered nux, to which he gives the preference on grounds which seem to indicate that he unconsciously inclines to a belief in the purely local nature of the disease, which is quite incompatible with the theories he has so eloquently advocated. Compare with the paper cited above one entitled *De l'emploi de la noix vomique contre la dysentérie et contre les paralysies dysentériques*, (par le docteur D. DE SAVIGNAC,)—Bull. Gén. de Thér., T. LXXIII, 1867, p. 193—which appears to be an abstract of it.

he prefer the alcoholic extract or the salts of strychnia; I confess, however, that I am not convinced by his arguments that the salts of strychnia are not likely to be equally efficacious in the intestinal paralyses. For this purpose the sulphate or acetate of strychnia may be given, preferably in solution, at first in the dose of one-thirty-second to one-sixteenth of a grain thrice daily, and gradually increased to one-tenth or even one-eighth of a grain. Larger doses should be regarded with suspicion, and even those last mentioned will require careful watching in order that they may be promptly diminished or discontinued on the occurrence of toxic symptoms.* If, however, strychnia is selected merely as a tonic, in cases uncomplicated by external paralysis, and in which there is no good reason for suspecting the existence of any paralytic condition of the intestine, the smaller doses named will be sufficient, and may advantageously be combined with quinia, iron, or both.

Among the *mineral tonics* deserved preëminence has long been enjoyed by the *chalybeates*, but their use in the fluxes has already been sufficiently discussed in previous pages of this work.† Next in importance stand the *mineral acids*, which were early introduced into medicine by the iatro-chemical school. First discovered, *sulphuric acid* was first brought into medicinal use. The red, green and white oils of vitriol, and a host of dulcified oils, waters, spirits and elixirs of vitriol, named generally after the chemists who devised them, were added to the resources of the physicians of the fifteenth, sixteenth and seventeenth centuries. Already Basil Valentine had a dulcified oil of vitriol,‡ and when Paracelsus wrote, the role of the preparations of sulphuric acid in the treatment of disease had become a subject of fierce debate. That erratic speculator, who lauded his own aquæ and spiritus vitrioli in epilepsy and other nervous diseases, in affections of the womb and in internal obstructions and inflammations, insisted that the utmost caution should be used in the case of the oil. It should never be given alone, but always diluted and combined with other medicinal preparations; nor should it be administered if the stomach was inflamed or contained bile; but with these precautions it was an excellent remedy that might be resorted to in anorexia and in fevers of every kind.§

Subsequent iatro-chemists made much of the use of the preparations of sulphuric acid in fevers, especially in malignant fevers. Its acidity was directly opposed to the alkaline putrescence of the humors; its tenuity was such that it could penetrate to all parts of the system, reach the interior even of organs that had become the seat of the most obstinate pathological obstructions, and neutralize the putrid humors there. Analogy early led them to extend these principles to the treatment of malignant, as well as of ordinary, dysenteries, and Angelus Sala went so far as to invent a vitriolated antidysenteric syrup and a vitriolated

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* H. C. Wood—*loc. cit.*, note *, last page—observes that "death has occurred from an irregularity in the solution of the pills in the alimentary canal and the consequent simultaneous letting loose of a large amount of the alkaloid." For this reason he advises that when it is desired to "push it until its physiological effects are manifested," it should always be administered as the sulphate in solution. This suggestion should never be disregarded. The danger of venturing upon such doses as were employed by Kendall—see note ‖, p. 808, *supra*—will be appreciated when it is remembered that half a grain has proved sufficient to destroy life. Consult on this subject Taylor—p. 712, *op. cit.*, p. 791, *supra*—and the works of the Husemanns, cited note *, last page.

† See pp. 762, 771, 785 and 805, *supra*.

‡ I have already expressed my regret that I have been unable to examine the writings of Basil Valentine, except the *Chariot of Antimony*; but James—Art. *Vitriolum*, Vol. III, *op. cit.*, p. 690, *supra*—states that he had a dulcified oil of vitriol, and Mangetus—T. II, p. 766, *op. cit.*, p. 736, *supra*—attributes to him a spiritus vitrioli antepilepticus, showing that the notion of the efficacy of this acid in epilepsy dates back to his time.

§ Paracelsus—*De naturalibus rebus*, Lib. I, Cap. 8, T. II, p. 202 *et seq.*, *op. cit.*, p. 336, *supra*—describes red, white and green oils of vitriol, besides aquæ vitrioli, spiritus vitrioli and a special antidote to epilepsy, *vitrioli contra caducum præparatio*. His whole discussion of the subject is characterized by his usual brutal violence. Rival chemists are *imperiti laboratores* for whom he has nothing but denunciation. Some of them have dared to use the pure oil of vitriol in disease; they say much of its virtues, but little is confirmed by experience. He has examined into the matter, and has found that those who boast that they have worked miracles with this oil have foully lied: "Vidi ego et comperi, eos qui miraculosa se oleo isto fecisse jactitant, turpiter mentitos esse." As for the Galenical physicians who refuse to use these preparations at all, they are the accursed priests and Levites who pass the sick man by on the other side, leaving him to the good Samaritan, Paracelsus, to cure. They deserve the fires of Gehenna, from which there is no redemption; they are possessed by the Devil, whom they serve, and who hardens their hearts against all truth.

antidysenteric confection, for which he claimed special virtues in this disease.* A fresh impetus was given to the use of these preparations by the speculations of Kircher, who suggested the employment of spirit of vitriol as a parasiticide, peculiarly fitted to destroy the vermiculi he imagined to be the cause of pestilential diseases.† His methods were adopted by several of the advocates of the animated pathology, and Christian Langius taught that the spirit of vitriol was more potent in the destruction of the verminous putridity that, according to him, caused diarrhœa and dysentery, than any other medicament, except, perhaps, the hoof of a horse sliced thin and fried in butter, which had been lauded as an arcanum by Van Helmont.‡

After the discovery of *nitric* and *muriatic acids*, these were brought into use for the same purposes as sulphuric, though by no means to the same extent.§ Even after the animated pathology had fallen into oblivion these acids continued to find favor among the so called antiseptic remedies employed in malignant fevers and dysenteries.‖ But about the commencement of the present century other notions concerning the utility of the mineral acids in the fluxes were brought forward. McGrigor employed nitric acid in the treatment of dysentery partly as an astringent, partly as a substitute for mercury, and on account of its supposed action on the liver. This method enjoyed for a time considerable popularity, and was adopted by Annesley, who regarded it as particularly serviceable in dysenteries attended with disease of the liver and a depraved secretion of bile.¶ It has continued to be occasionally employed from time to time, and if the speculation of Bailey,

* See ANGELUS SALA—*Anatomia vitrioli* and his *Diss. de natura, proprietate et usu, spiritus vitrioli*, Opera, p. 358 *et seq.*, and p. 404 *et seq.*, Ed. cited p. 776, *supra*—who gives methods for the preparation of, 1, ros vitrioli; 2, aqua vitrioli secunda; 3, liquor vitrioli acidus primus, vulgo spiritus vitrioli; 4, spiritus sulphuris vitrioli et liquoris acidi primi rectificatio; 5, liquor vitrioli acidus secundus, vulgo oleum vitrioli appellatus; besides formulæ for a variety of nostrums into which one or another of these forms of sulphuric acid entered as ingredients, such as his liquor antepilepticus, liquor cardiacus, liquor restaurativus, liquor contra pruellam, liquor contra pestem, and the two antidysenteric preparations mentioned in the text. His confectio contra dysenteriam consisted of the spiritus vitrioli acidi, combined with his laudanum—see p. 736, *supra*—lachrymæ draconis and conserve of roses; his syrupus dysentericus vitriolatus was prepared by boiling tormentil root, myrobalans, sanguinaria seed and red rose leaves in water and adding spiritus vitrioli and sugar. The doctrine of the action of the various forms of spiritus vitrioli in pestilential and other fevers, sketched in the text, will be found fully elaborated on pp. 360, 378 and 417. So, likewise, I may cite OSWALD CROLL—p. 282, *op. cit.*, p. 736, *supra*—who had a stomachic oil of vitriol that was useful in fevers and abnormal thirst, served as a prophylactic against pest if mixed with sugar and electuary of juniper, and was useful in all putrid diseases and obstructions: "Post evacuatum corpus cum theriaca seu aquis appropriatis fere in omnibus morbis exhiberi potest, aciditate enim sua putredinem omnem arcet, partium vero tenuitate obstructiones pellit"—p. 286. For details with regard to the preparations of sulphuric acid in use in the latter part of the seventeenth century and the early part of the eighteenth, I may refer to MANGETUS—Vol. II, p. 761 *et seq.*, *op. cit.*, p. 736, *supra*.

† A. KIRCHER—p. 185, *op. cit.*, p. 369, *supra*. In the use of sulphuric acid he professedly followed PARACELSUS, for, after naming the Galenical antidotes to pest, he adds: "Hisce accenset Theophrastus spiritum vitrioli una cum aqua ex oxali seu acetosa extracta, sudandi gratia assumptum;" and then explains, "sunt enim tria in vitriolo consideratione dignissima, quibus virulentus hospes omnino prosternitur, extinguiturque. Siccitate sua naturæ peregrina putredo exeditur; astringendi vero vi laxatarum partium colligatio roburque ad externam vim propulsandam conceditur, tandem vi caloris nativi, externus advenions calor prorsus superatur." CHRISTIAN LANGIUS—p. 467, *op. cit.*, p. 369, *supra*—after explaining that VAN HELMONT'S nostrum, mentioned in the text, is probably useful, because its sulphurous vapor is fatal to the verminous putridity, remarks: "De nostro hoc tantum addimus, quod illa remedia præter ea, quæ animatam corruptionem peculiariter extinguunt, et fermentationis malignæ tyrannidem compescunt, suum quoque hic sibi locum vendicent, quæ supra (p. 292) in curatione exulceratarum faucium ac tonsillarum laudata fuerunt. Ubi præsertim usus olei seu spiritus vitrioli tanquam summum specificum contra hujuscemodi ulcerationes et inflammationes insinuatus fuit." He therefore recommends the use of a julep suitably impregnated with the oil or spirit to be taken internally, and also the use of enemata containing enough of the same to give a slightly acid taste.

‡ The passages in which VAN HELMONT recommends the nostrum referred to will be found in the tracts *Pylorus rector*—p. 231—and *Ignota actio regiminis*—p. 310, *op. cit.*, p. 488, *supra*. In both he explains, however, that you must be careful not to select a young mare in the rut, for her hoof would be fatal: "Sed si bestia lasciviat, tunc ejus ungula est dysentericis lethalis." The former of these tracts contains the pathology of dysentery as understood by this author. The pylorus is the governor (rector) of the whole digestive economy, intestinal as well as gastric; diarrhœa and dysentery result when there is a disagreement between the pylorus and the bile—p. 229. The object of treatment is to appease the raging pylorus, (furorem pylori sedari,) and for this purpose two yolks of hard-boiled eggs, tempered with rose-vinegar, will also answer excellently. Elsewhere—*Potestas medicaminum*, p. 476—he commends another admirable remedy: A towel soaked in the blood of a hare hunted to death may be dried and pieces of it administered in wine; or the hare may be dried in smoke and pieces of it given in drink, as is done by the German soldiers; and this is an infallible cure. It must be remembered that, for VAN HELMONT, diseases were entities, "sed morbus est ens reale"—*Ignotus hospes morbus*, p. 492—and that he ridiculed the idea that the intestines were ulcerated in dysentery, which in that event would be incurable—*Pleura furens*, p. 397.

§ Nitric acid was known to PARACELSUS, who sometimes called it *aqua fortis*—*Archidox.*, Lib. II et III, Vol. II, p. 7—sometimes *aqua regis*—*De præparationibus*, Lib. I, same Vol., p. 82, *op. cit.*, p. 336, *supra*. Muriatic acid was first isolated by GLAUBER—see note ‡, p. 736, *supra*.

‖ See, for example, G. WEDEKIND—*Nachrichten über das französische Kriegsspitalwesen*, Bd. I, Leipsic, 1797, S. 189: "Allgemeine antiseptische Mittel sind, die Säuern, besonders die mineralischen." Compare also his essay *Ueber die Ruhr*, Frankfort, 1811, S. 86, where vitriolic acid, sulphur, salmiac, camphor, wax and arnica are praised as antiseptic measures especially useful in dysentery.

¶ JAMES MCGRIGOR—*A memoir on the state of health of the 88th regiment, and of the corps attached to it, from 1st June 1800 to the 31st May 1801, as originally presented to the Medical Board, Bombay*, Edinburgh Med. and Surg. Jour., Vol. I, 1805; I cite the 2d Ed., p. 281—also p. 185, *op. cit.*, p. 713, *supra*—where he mentions that DEAN and BELLARS of the 86th regiment had treated several hundred cases of dysentery solely by the nitric mixture and baths. ANNESLEY—Vol. II, p. 295, *op. cit.*, p. 621, *supra*—thought it especially useful after mercurials have been used, and when the disease becomes subacute or chronic; it was still more useful when combined with opium.

that it is possessed of antiperiodic powers were true* it might be resorted to with advantage in fluxes complicated with malarial conditions.

*Nitro-muriatic acid*, to which attention was directed by Scott, who claimed that it is a powerful remedy in acute and chronic hepatitis,† has, however, replaced nitric acid to a certain extent. Its use in dysentery was regarded with favor by Parkes and Martin, and it is still occasionally employed in certain varieties of chronic diarrhœa.‡ Another substitute for nitric acid is the *nitrous-acid mixture*, which Hope employed in the treatment of dysentery at the beginning of the century, and Bryan used with success in the Philadelphia epidemic of 1847.§ This mixture enjoyed the confidence of Tripler in the treatment of chronic dysentery, and quite recently H. C. Wood has declared that he obtained excellent results with the original formula in certain diarrhœas, although he failed absolutely with the commonly-employed substitute in which ordinary nitric acid is used instead of the fuming acid.‖ Meanwhile the old use of dilute sulphuric acid in diarrhœa has been revived by Anthony Todd Thomson, who found followers in Griffith and numerous other physicians, especially in England, from 1851 to 1854.¶ It is probably more extensively used in the treatment of the fluxes at the present time than any other mineral acid.

During our civil war the mineral acids were resorted to by a number of military surgeons. The commendation of Tripler induced some to employ Hope's mixture; but the aromatic sulphuric acid was undoubtedly the most popular preparation, and was generally combined with laudanum. These acids were administered not only in the chronic fluxes,

* G. Mendenhall—*On the use of nitric acid as an antiperiodic*, The Western Lancet, Vol. XV, 1854, p. 472: "The facts upon which this paper is based, are taken mainly from an inaugural dissertation, presented to the Trustees and Faculty of the Miami Medical College, for the degree of Doctor of Medicine, by E. T. Bailey, M. D., of Emmettsville, Indiana." Observations in confirmation of those of Bailey have been brought forward by I. A. Coons—*Report of the committee on a substitute for quinine*, Trans. of the Ohio State Med. Society, June, 1856, in The Ohio Med. and Surg. Jour., Vol. IX, 1856-7, p. 275; W. A. Hammond—*Nitric acid in intermittent fever*, The Maryland and Virginia Med. Jour., Vol. XVI, 1861, p. 104; and B. Brown—*Some remarks on the adynamic type of remittent fever and its treatment with nitric acid*, The Amer. Jour. of the Med. Sci., Vol. XXXIX, 1860, p. 43. It is needless to remark that this practice has not yet supplanted quinia.

† H. Scott first recommended the use of nitric acid for this purpose in 1796 in letters which have been printed by T. Beddoes—*A collection of testimonies respecting the treatment of the venereal disease by nitrous acid*, London, 1799, p. 1 *et seq.* In one of these letters he remarks, after describing the method by which the nitric acid was made: "As the nitre that I used contained about six per cent. of sea salt, it will be evident that the acid that I obtained is not a pure acid of nitre, but it is a mixture of nitric acid, and oxygenated muriatic acid, or it is an aqua regia, in which the marine acid bears a small proportion to the nitric acid"—p. 9. In a subsequent paper—*On the internal and external use of the nitro-muriatic acid, in the cure of diseases*, (read March 4, 1817,) Medico-Chirurg. Trans., Vol. VIII, 2d Ed., 1820, p. 175—he mentions that he long believed the good effects of the mixture were due to the nitric acid only; but when he procured some of the pure acid he was disappointed in the results, and therefore returned to a mixture, at first of three parts of nitric acid to one of muriatic, and subsequently employed them in equal weights. He introduced the baths of this acid, which were afterwards employed also by Annesley—*loc. cit.*, note ¶, last page: see also, on the use of these baths, G. J. Guthrie—*On the effects of the nitro-muriatic acid bath in several surgical diseases*, The London Med. Repository, Vol. VIII, 1817, p. 449.

‡ Parkes—p. 151, *op. cit.*, p. 682, *supra*. Martin—p. 465, *op. cit*, p. 621, *supra*. H. C. Wood—p. 98, *op. cit.*, p. 675, *supra:* "In those forms of chronic diarrhœa in which the disease is really an intestinal dyspepsia, nitro-muriatic acid may be of the utmost service, benefiting and even curing cases which have resisted all other treatment."

§ Thomas Hope—*Observations on the effects of nitrous acid and opium in the cure of dysentery*, The Med. and Phys. Jour., Vol. III, 1800, p. 413, and *Observations on the powerful effects of a mixture containing nitrous acid and opium in curing dysentery, cholera, and diarrhœa*, The Edinburgh Med. and Surg. Jour., Vol. XXVI, 1826, p. 35. His formula, as given in the latter article, was: "℞. acidi nitrosi ʒj, mist. camphor. ʒviij. Misce et adde tinct. opii, gtt. xl. Sig. One fourth part to be taken every three or four hours." He insisted strongly upon the use of what is still called nitrous acid in the shops, or sometimes fuming nitric acid, (really a solution of pernitric oxide in nitric acid,) and declared that ordinary nitric acid with opium produced no good effects. James Bryan—*Epidemic dysentery*, The New York Jour. of Med., Vol. X, 1848, p. 49.

‖ Tripler—p. 34, *op. cit.*, p. 691, *supra*. H. C. Wood—p. 97, *op. cit.*, p. 675, *supra*—after insisting upon the point made in the text, remarks: "Made in this way, and used whilst fresh. Hope's camphor mixture is a very efficient though disagreeable remedy in diarrhœas connected with disordered secretion of the liver and other glands of the alimentary canal." It is my duty to add that I have no confidence whatever in this view of the matter.

¶ Anthony Todd Thomson—*The London Dispensatory*, 1837, p. 762; I have not seen this edition, our library only possessing that of 1815, and quote from Griffith—cited *infra*—who remarks: "I would here call the attention of your numerous readers to the fact of this remedy having been recommended by the late Dr. Anthony Todd Thompson in diarrhœas. In the 'London Dispensatory' of 1837, page 762, there is an article on the Diluted Sulphuric Acid, in which he states, 'that when combined with mucilages, it has been beneficially given in passive diarrhœas, operating on the relaxed nervous coat of the intestine as an astringent. The usual dose is from ten to thirty minims, but this dose may be very often repeated.'" Wm. Griffith—*Treatment of diarrhœa by sulphuric acid alone*, The Lancet, 1851, Vol. II, p. 334—reported several cases of diarrhœa successfully treated in this way, and some years later—*Sulphuric acid in diarrhœa*, Med. Times and Gaz., 1862, Vol. I, p. 68—had so far forgotten his original article as to write: "Having been the first person to introduce to the profession the treatment of diarrhœa by sulphuric acid, when I published some cases in 1851," &c. Corroborative testimony has been published by J. Ashbury Smith—The Lancet, 1851, Vol. II, p. 359; G. B. Payne—same Vol., p. 382; E. Sheppard—Provincial Med. and Surg. Jour., Vol. XVI, 1852, p. 471; J. J. Mitchell—same Vol., p. 566; J. L. Vandervoort—The New York Med. Times, Vol. II, 1852-3, p. 75; John Hill—The Med. Times and Gaz., Vol. XXVI, 1852, pp. 197 and 578; R. Neale—same Vol., p. 472; F. Collins—same Vol., p. 521; J. M'Donnell—same Vol., p. 600; W. Braithwaite—same Vol., p. 629; J. Mann—same page; C. M. Miller—The Lancet, 1852, Vol. II, p. 323; John Denny—same Vol., p. 556; S. W. North—The Med. Times and Gaz., Vol. XXVII, 1853, p. 159; Goodeve Bowra—The Lancet, 1854, Vol. I, p. 98; F. M. Davidson—same Vol., p. 404; and Andrew Clark—Med. Times and Gaz., 1862, Vol. I, p. 10.

but in acute diarrhœa and in the advanced stages of acute dysentery. They were undoubtedly frequently useful, but achieved no such striking success as to lead to their general employment.* Nor, when the little that is known with certainty of the mode in which medicinal doses of the mineral acids act is considered, will it appear surprising that anything like their indiscriminate use in the fluxes so often proves inefficient or injurious.

In view of the strong affinity of these acids for bases and the prompt manner in which they combine with them, in such mixtures as the alimentary contents, it is exceedingly improbable that they can make their way in the free state very far into the intestinal canal to neutralize abnormal alkalinity or exert directly a local astringent action, as has been fondly hoped even in modern times.† The old doctrine that they act by diminishing the alkalinity of the blood, and in this way restrain septic tendencies, still survives; even such observers as Bence Jones and Headland maintain that the alkalinity of the blood may thus be diminished.‡ But this view is not supported by the evidence of actual experiment, and, as Buchheim has suggested, the quantity of the mineral acids that can be safely administered for medicinal purposes is hardly sufficient to go very far in this direction.§ The refrigerating effect they are said to produce in fevers is probably a mere phenomenon of sensation due to their local impression upon the mouth, pharynx and stomach; at least thermometric observations, to show that an actual lowering of temperature results from their use, have not yet been put in evidence.

The primary and most important action of medicinal doses is undoubtedly to increase the activity of digestion. In the languid condition of this function that so often accompanies acute and chronic fluxes, this property of the acids is often exceedingly useful. With the increased activity of digestion and assimilation that often follows their moderate use, the strength and general condition of the patient not infrequently improves, and with improved health the flux diminishes or ceases. Moreover, as recent experiment appears to confirm the opinion that nitro-muriatic acid increases the hepatic secretion,‖ it is probable that it may be advantageously selected in acholic conditions. Unfortunately, however, the continued use even of moderate doses of the mineral acids after temporarily improving is prone in the end to disorder the digestive processes and to produce gastric catarrh or even diarrhœa.¶ A protracted course of acid treatment is therefore seldom permissible.

The old use of sulphuric acid as a parasiticide has been revived by some of those who believe the fluxes to be caused by specific bacteria;** but the speculation that it can act in this way is unsupported by facts. If bacteria in the blood are intended to be killed, we know too well the acid can never be made to reach them; but it is not as generally under-

* Reports will be found in Section II favorable to the use of nitric acid by DEBRUEL—p. 42, *supra*, and TAYLOR—p. 87; of Hope's mixture by TUTTLE—p. 90; of dilute or aromatic sulphuric acid by SCHÜSSLER—p. 44; BLAKESLEE—p. 76; WALTON—p. 88; COFFMAN—p. 97; and BRADT—p. 100; of the mineral acids, without specifying which, by PENROSE—p. 45, and GRANGER—p. 86. Hope's camphor mixture is also recommended by BROWER—*op. cit.*, p. 779, *supra*, and aromatic sulphuric acid by KEMPSTER—*op. cit.*, p. 493, *supra*. For my own views, in 1863, on the use of the mineral acids in the fluxes, see p. 259, *op. cit.*, p. 606, *supra*.

† F. SCHNEIDER—*Dysenterie, rothe Ruhr, ihr Wesen und ihre Behandlung*, Leipsic, 1873, S. 30—recommends the use of sulphuric acid as an astringent in the advanced stages of dysentery, and also in hæmorrhagic cases for the arrest of the hæmorrhage.

‡ H. BENCE JONES—pp. 24 and 288, *op. cit.*, p. 804, *supra*; HEADLAND—p. 135, *op. cit.*, p. 790, *supra*.

§ BUCHHEIM—S. 175, *op. cit.*, p. 746, *supra*. I would refer the reader to this work especially for an excellent summary of the little that is positively known with regard to the physiological action of the dilute mineral acids. See, also, on the particular question referred to in the text, A. TRACHTENBERG—*Zur Frage über die Neutralisation überschüssiger Alcalien im Blute*, Inaug.-Diss., Dorpat, 1861.

‖ RUTHERFORD and VIGNAL—Experiment 30, *op. cit.*, p. 701, *supra*.

¶ See, on this subject, BUCHHEIM—S. 174, *op. cit.*—and NOTHNAGEL—S. 379, *op. cit.*, p. 746, *supra*.

** See, for example, the report of J. M. WOODWORTH—*The introduction of epidemic cholera into the United States through the agency of the mercantile marine*, &c., Ex. Doc. No. 95, 43d Congress, 2d Session, Washington, Government Printing Office, 1875, pp. 8 and 17—on the use of sulphuric-acid lemonade as a prophylactic against cholera: "There can be little doubt, despite the *dicta* of the last International Sanitary Conference, that *we possess in the mineral acids a certain means of prophylaxis against cholera*." For a recommendation of dilute sulphuric and other mineral acids as parasiticides in diarrhœa, see the paper of WM. JOHNSTON, cited note †, p. 804, *supra*.

stood as it should be, that the attempt to kill bacteria in the intestinal canal by any dose of sulphuric acid that can be administered by the mouth without danger to life is equally futile; and that the various forms of bacteria normally present in the stools, whether diarrhœa exist or not, are equally numerous and vivacious in the stools of those who have been taking sulphuric acid for days or weeks.

It is therefore chiefly, if not exclusively, as adjuvants to the digestive process that the mineral acids are useful in the fluxes. With this view they should be given only with the food and in moderate doses; ten to twenty drops are a sufficient dose of diluted or aromatic sulphuric acid,* of diluted muriatic acid or diluted nitric acid. The diluted nitro-muriatic acid does not keep well, and it is better, therefore, to prescribe the strong acid in the dose of five to eight drops and dilute it at the time of administration. These doses may be taken three or four times daily. To use them more frequently or to employ larger doses is only to risk unnecessarily the early development of gastric disturbance.

Dilute *phosphoric acid* has also been employed in the chronic fluxes, especially by Schneider,† but further observations are needed to show how far it is a desirable substitute for the other mineral acids in this class of cases.

In this place also the use of the *vegetable acids* in the fluxes may be mentioned; but as they are chiefly, if not exclusively, useful in cases complicated with scurvy or a scorbutic taint,‡ the discussion of their utility will be postponed to a subsequent chapter.

Aromatics.—The Greek physicians employed a great variety of aromatic drugs in the treatment of the fluxes. *Anise, fennel, cardamom, pepper, ginger, mint, cassia, cinnamon* and *spikenard* may be mentioned as prominent among the substances of this character with which they were acquainted, and one or more of these figure in most of the anodyne and astringent formulæ preserved by Galen, Ætius, Alexander of Tralles and Paulus Ægineta.§ The Arabians continued to use most of these substances in the same way, and added several others, among which *orange-peel, cloves, mace* and *nutmeg* may be particularly mentioned;‖ the last named substance subsequently acquired considerable renown as an antidysenteric.¶ Among the aromatics brought into use at a later period *capsicum, peppermint, lavender* and *canella* may be referred to.**

During the early part of the last century it was common to employ the culinary spices and ginger with wine and brandy as domestic remedies for the fluxes. Zimmermann earnestly protested against tolerating this practice in the early stages of dysentery, pointing out that, although the flux might thus be checked for a time, it presently returned, and that

* The aromatic sulphuric acid of our Pharmacopœia is the descendant of the elixir of vitriol of Mynsicht: see Mangetus—T. I, p. 807, *op. cit.*, p. 736, *supra*. In the modern preparation the sugar originally used is omitted, and ginger and cinnamon are the only aromatics retained.

† Schneider—S. 29, *op. cit.*, note †, last page.

‡ Savignac, indeed, did not hesitate to write of them—p. 393, *op. cit.*, p. 620, *supra:* "Les acides, en un mot, sont pendant et après la maladie, plus nuisibles qu'utiles aux dysentériques."

§ See the passages in these writers cited in notes § and ‖, p. 735, *supra*. Descriptions of the several substances named are given by Galen, Dioscorides and Paulus. The *mint* was probably our *mentha sativa*.

‖ *Orange-peel* and an oil prepared from it are mentioned by Ebn Baithar—Ed. II, S. 545, Ed. cited p. 704, *supra*. *Cloves* are mentioned by Paulus—Vol. III, p. 160, Ed. cited p. 624, *supra*—but are noticed by none of the earlier Greek writers. They are quite fully described by Serapion—*De temp. simp.*, Cap. 309, fol. 172, Ed. cited p. 806, *supra*—and other Arabian writers. Serapion also described *mace*—Cap. 2, fol. 121—and *nutmeg*—Cap. 161, fol. 145, *op. cit.* Here, too, I may allude to two animal substances which were long used in the fluxes very much in the same way as the aromatics. The first is *castor*, which was well known to the Greek physicians, and which Archigenes considered of such importance that he wrote a special treatise on its medical use; see Galen—*De simp. med. temp. ac fac.*, Lib. XI, Cap. I, [Ed. Kühn, XII, 337.] It figures in several of the formulæ referred to in note §, *supra*, and Avicenna employed it to counteract the depressing influence of opium—see note *, p. 736, *supra*. *Musk* was introduced by the Arabian physicians. It is described by Serapion—Cap. 185, fol. 149, *op. cit.*, *supra*—and others. Long employed in the fluxes in the same way as castor, its use for this purpose is now quite obsolete.

¶ See, on this subject, note ‖, p. 776, *supra*.

** *Capsicum* appears to have been brought to Europe shortly after the discovery of America; *canella* almost a century later. *Lavender* is already mentioned by the Abbess Hildegard in the twelfth century, and in the Rhyme of the School of Salerne, while *peppermint* was first brought into medicinal use in England about the close of the seventeenth century. See the *Pharmacographia*, pp. 406, 68, 428 and 433, Ed. cited p. 703, *supra*.

the condition of the patient was only aggravated by the vain attempt. It is to be regretted that such "stupid domestic remedies," as Zimmermann justly called them, are by no means banished from family use in our own day.* All these aromatics and the volatile oils to which they owe their virtues are local irritants, and should therefore be employed with a sparing hand in acute inflammations of the gastro-intestinal canal.† They may, however, be used with advantage in small quantities, during subacute or chronic fluxes without pain or fever, to give an agreeable taste to other medicines, and larger doses may sometimes serve a useful purpose by temporarily stimulating the flagging digestive functions, or by acting as carminatives to relieve flatus. Further investigations into the physiological action of the volatile oils may perhaps suggest for some of them a wider range of usefulness;‡ but the indications just sketched represent all that can as yet be considered as fully established with regard to their use in the fluxes. Undoubtedly slight diarrhœas often disappear promptly after the administration of alcoholic solutions of these substances; but even such cases can be more uniformly and promptly relieved by other measures.

RESINS, BALSAMS, OIL OF TURPENTINE and CAMPHOR.—A large number of resinous substances and balsams, such as *frankincense*, *myrrh*, *mastich*, *turpentine*, *styrax* and *opobalsam*, were regarded by the Greek physicians as possessed of calefacient and drying properties, and were combined with the remedies they administered in the fluxes.§ They also used them as external applications in the treatment of callous ulcers,‖ and this practice appears to have suggested their use in those fluxes in which such ulcers were supposed to exist in the intestines.¶ Moreover, as the fruit and other parts of the shrub from which mastich is derived had the reputation of being astringent, and a decoction of it was long employed with supposed benefit in the fluxes,** these virtues were subsequently assigned to its resinous exudation, which obtained, perhaps in this way, a sort of priority over the other drugs of this group. The Arabian and mediæval physicians employed these substances in the same way, and after the importation of the *balsams* of *Peru* and *Tolu* from America they, too, were occasionally employed for the same purpose.†† Even Degner believed that drugs of this class favored the cicatrization of intestinal ulcers, although he admitted that he had derived little benefit from them during the Nimeguen epidemic.‡‡

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* ZIMMERMANN—Cap. VII, S. 161, *op. cit.*, p. 648, *supra:* "Alle Aerzte in der Schweiz, die an der Ruhr kranke Bauern in sehr verwirrten Umständen finden, haben dieses von dem Gebrauche stopfender Arzneyen, und dummer Hausmittel herzuleiten; aber insbesondere von den Muscatennüssen, Muscatenblüthe, Ingwer, Pfeffer, Wein, und Brandtwein, die freilich die Ruhr für eine Weile zurückhalten, aber bald darauf den Kranken in die gefährlichsten Uebel stürzen."

† And yet from time to time some particular aromatic is lauded as though it were an exception to this general rule. Thus SAVIGNAC—p. 394 *op. cit.*, p. 620, *supra*—writes of *canella:* "J'ai une grande confiance en la *cannelle* dans le traitement de la dysentérie, et j'en donne les préparations à toutes les périodes de la maladie. Stimulant puissant, on en proportionne la dose à la somme d'énergie que l'on veut communiquer quand les forces languissent ou quand l'adynamie se prononce." Now, frankly, I can no more accept this view than I can admit that it is possible to "communicate energy" by canella under any circumstances.

‡ See the sketch of the present state of knowledge on this subject in the work of BUCHHEIM—S. 564, *op. cit.*, p. 746, *supra*—who discusses these aromatic oils in the same group with oil of turpentine, &c., under the heading "Gruppe des Turpenthinöls."

§ See the accounts of these substances given by GALEN in the treatise *De simp. med. temp. ac fac.* According to him *frankincense* was also astringent, and therefore particularly useful to cœliacs and dysenterics—Lib. VII, Cap. 11, [Ed. Kühn, XII, 60;] *myrrh* was useful in expelling lumbricoids and favoring the cicatrization of ulcers—Lib. VIII, Cap. 17, [same Vol., 127;] *mastich* and *turpentine* he classed under the head of resins—p. 113. For his account of *styrax*, see p. 131; of *balsam*, same treatise, Lib. VI, Cap. 2, [Vol. XI, 846.] The juice of the balsam tree was known as *opobalsam*, while the twigs were called *xylobalsam*. The best opobalsam came from Syria—*De antidotis*, Lib. I, Cap. 2, [Vol. XI, 7,]—and was no other than the famous *balm of Gilead*. These substances figure in the formula referred to on p. 735, *supra*, and most of them were ingredients of theriaca.

‖ PAULUS ÆGINETA, for example—Lib. IV, Cap. 39, Vol. II, p. 103, Ed. cited p. 624, *supra*—mentions styrax, resin, pitch and mastich among the remedies suitable for this purpose.

¶ Thus PLINY—*Nat. Hist.*, Lib. XXIV, Cap. 22, Vol. VII, p. 3506, Ed. cited p. 771, *supra*—who divides the resins into two species, the dry and the liquid, says that of the latter the product of the larch is employed in coughs and ulcers of the bowels: "Medici liquida raro utuntur, et in ovo fere: e larice propter tussim ulceraque viscerum."

** See GALEN—*De simp. med. temp. ac fac.*, Lib. VIII, Cap. 18, [Ed. Kühn, XII, 135;] DIOSCORIDES—Lib. I, Cap. 90, fol. 38, Ed. cited p. 623, *supra;* and AVICENNA—Lib. II, Tract. 2, Cap. 461, Vol. I, p. 354, Ed. cited p. 632, *supra.*

†† The balsams of Peru and Tolu found their way to Europe during the 16th century: see the *Pharmacographia*, p. 177, Ed. cited p. 703, *supra.*

‡‡ DEGNER—Cap. V, § 24, p. 279, *op. cit.*, p. 625, *supra*—names in this connection oil of amber, balsam of Peru, turpentine and certain "resinous gums," e. *g.*, olibanum, myrrh, mastich, amber and the like: see also, on their use in the fœtid ulcers of chronic cases, Cap. III, § 81, p. 201.

Among the modern physicians who have lauded the employment of balsamic remedies for this purpose I may particularly mention Savignac,* who, however, is by no means alone in this matter. The *compound tincture of benzoin*, which Ellis (1856) recommended in chronic dysentery,† contains, besides benzoin, styrax and the balsam of Tolu as well as aloes, and has enjoyed a certain share of popularity. It is, however, very doubtful whether the balsams exert any particular influence on the intestinal ulcers; certainly they are not more efficient in this way than the oil of turpentine, and the question whether they may not possibly prove beneficial in consequence of the diuretic action of the benzoic acid they contain is one for the solution of which the evidence is as yet insufficient.‡

The *balsam of copaiba*, which Piso and Marcgrave (1648) reported was employed by the Brazilians in diarrhœa and dysentery,§ was again brought forward at the commencement of the present century by Pemberton, who recommended it in the later stages of acute dysentery as well as in chronic cases. It has since been employed with alleged advantage in one or both of these conditions by Armstrong, Woolrich, Pearson, Cheyne, Eberle, La Roche, Robarts, Hatheway and others, while Bampfield was unsuccessful in the trials he made of it.‖ Its use for this purpose was, however, seldom if ever resorted to during our civil war,¶ and I believe at the present time may be regarded as obsolete. The nauseous character of the drug, and a consideration of the readiness with which it irritates even the healthy intestine, when administered, as it has been so freely, for diseases of other organs, will probably discourage any attempt to revive this disagreeble practice.

Greater popularity has been enjoyed by the *oil of turpentine* in the treatment of the fluxes. We begin to hear of the medicinal use of this oil in the latter part of the seventeenth century. It was believed to be possessed of the virtues of turpentine in a more concentrated form, and was employed in the diseases for which that drug was then commonly given, such as catarrhs, phthisis and other affections of the lungs, calculous and other disorders of the kidneys, gonorrhœa and leucorrhœa. It was regarded as eminently heating, aperient, diuretic and antiseptic; but the inconveniences resulting from the administration of excessive doses appear to have limited its employment and called forth grave warnings from Hoffmann and Boerhaave, so that according to Murray (1776) it was very rarely used

* SAVIGNAC—p. 411, *op. cit.*, p. 620, *supra*.

† R. W. ELLIS—*On the treatment of chronic dysentery*, The Lancet, 1856, Vol. II, p. 221. It is also classed by CAMPBELL—Vol. XIV, p. 152, *op. cit.*, note ‡, p. 402, *supra*—among the remedies which he calls "rationally specific" in dysentery, viz: "benzoin, balsam copaiba, creosote, turpentine and the like." He cites ELLIS in commendation of the compound tincture of benzoin, and mentions having used it successfully "in a single case."

‡ See, on the subject of the physiological action of benzoic acid, H. C. WOOD—p. 504, *op. cit.*, p. 675, *supra*—and the authorities cited by him.

§ PISO—Lib. IV, Cap. 4, p. 57, *op. cit.*, p. 692, *supra*: "Pectori, ad stomachum languidum, ventri ad colicos frigidos cruciatus, illitum conducit: guttulæ aliquot convenienter exhibitæ per os, robur addunt visceribus, illisque tonum reddunt: fluxiones muliebres, cursus ventris et gonorrhœas quoque sistunt. In anum per clysteres, in penem per syringam cum saccharo ex aqua plantaginis, vel oleo rosarum dissolutum, adversus endem mala prospero successu injicitur." G. MARCGRAVE, (de Liebstad,)—*Hist. rerum naturalium Brasiliæ*, (bound up with the last cited work,) Lib. III, Cap. 17, p. 131: "Nervis apprime amicum est: tres vel quatuor guttulæ in ovo sorbili bis vel ter mane sumtæ, dysenteriam vel alios fluxus ventris sistunt et curant."

‖ PEMBERTON—Chap. VIII, p. 145, Ed. cited p. 344, *supra*—used internally a mixture containing copaiba in acute dysentery after "the griping pain had in some degree subsided," and also employed it after the disease "put on the form of chronic diarrhœa." He also in both classes of cases used enemata of balsam of copaiba and starch water. J. ARMSTRONG—*Facts, Observations, and Practical Illustrations*, &c., (1813.) Amer. Ed., Hartford, 1823—article on "Balsam of Copaiva," p. 9—recommended it especially in chronic dysentery as "a suitable laxative, and also a salutary stimulus to the ulcers themselves." WOOLRICH is stated by MCGRIGOR—p. 434, *op. cit.*, p. 612, *supra*—to have used a mixture of balsam of copaiba (in gum Arabic with infusion of calumba) in chronic dysenteries during the Peninsula campaign, and with "great benefit." PEARSON is said by BAMPFIELD—*loc. cit.*, *infra*—to have cured an obstinate case with it. CHEYNE—p. 45, *op. cit.*, p. 686, *supra*—used "the capivi mixture" in acute dysentery, after venesection, calomel and opium. EBERLE—Vol. I, p. 246, Ed. cited p. 778, *supra*—remarked: "In chronic dysentery, balsam copaiva frequently does excellent service." R. LA ROCHE—*Obs. on the use of the balsam of copaiba in diseases of the mucous membrane of the intestinal canal*, The Eclectic Jour. of Med., Vol. II, 1837-8, p. 408—thought it "as serviceable in the secondary stages of acute dysentery as in the chronic form"—p. 414. H. ROBARTS—*Case of suspected ovarian disease*, &c., *with remarks*, The Lancet, 1839-40, Vol. I, p. 569—commended it in "chronic gastro-enteritis." O. P. HATHEWAY—*On the treatment of dysentery with acetate of lead and balsam of copaiba*, The New York Jour. of Med., Vol. XI, 1853, p. 56—recommended it even in acute cases: "Again: we have another excellent remedy, I was about to say a specific, in balsam copaiba." See also CAMPBELL—*loc. cit.*, note †, *supra*—and BAMPFIELD—p. 209, *op. cit.*, p. 682, *supra*.

¶ And yet it was commended by GEORGE B. WOOD—Vol. I, p. 722, *op. cit.*, p. 671, *supra*—in the same class of cases in which he employed the oil of turpentine; and in the tract of STILLÉ—p. 379, *op. cit.*, p. 650, *supra*—who, speaking of the medicaments suitable in chronic dysentery, remarks: "Among remedies of this kind, balsam of copaiva is one of the most valuable."

by the physicians of his time.* It is stated by Rush that oil of turpentine was successfully employed in Philadelphia by Physick, during the yellow fever of 1805, to arrest the hæmorrhagic vomiting characteristic of that disease.† This circumstance induced Chapman to try it in gastritis, and by analogy in enteritis and dysentery: his views on this subject were published in 1819.‡ In 1821 Copland reported that he had employed it with success in several cases of chronic dysentery, and also recommended its use in the chronic diarrhœa of children.§ The manner in which Cheyne combined it with purgative doses of castor oil in the treatment of dysentery has already been referred to.‖

The use of this remedy in the fluxes never, however, enjoyed the reputation either in England or on the Continent which it subsequently obtained in the United States. The well known views of George B. Wood as to its utility in typhoid fever were extended by him to dysentery and the fluxes generally. He taught that whenever the tongue became smooth and dry, in acute or chronic diarrhœa or dysentery, the oil of turpentine was indicated, and acted both as a stimulant and local alterative, the latter property proving especially beneficial in case of the existence of intestinal ulceration.¶ These teachings, like those of this distinguished professor with regard to the use of the oil of turpentine in typhoid fever, were widely adopted in the United States; but the application of the remedy was by no means always limited to the special conditions he had indicated, and the opinion arose in

* The distilled oil of turpentine makes its first appearance in medical literature during the latter part of the seventeenth century. I find in the Augsburg Pharmacopœia of 1684, p. 311, directions for preparing it under the title oleum terebinthinæ, with the statement that the white oil that comes over first is popularly called spirits of turpentine, "quod spiritus nomine vulgo donatur." The essay of JAMES YOUNG—*Triumphal car of turpentine*, London, 1679—I regret to say is not in our library; (I cite from BOERHAAVE—*loc. cit., infra.*) SCHROEDER is cited by MANGETUS—T. II, p. 965, *op. cit.*, p. 736, *supra*—as saying of the spirits of turpentine: "Spiritus calfacit, siccat, attenuat, urinam ciet, tartaream mucilaginem resolvit. Hinc confert in tussi, aliisque pulmonum affectibus tartareis, in lienis et uteri obstructione, in calculo renum et vesicæ, in stranguria, gonorrhœa virulenta, ulceribus penis ex lue venerea. N. Urina odorem violaceum conciliat." JAMES—T. III, Art. *Terebinthus*, *op. cit.*, p. 690, *supra*—writes: "Turpentine distil'd, or oil of turpentine, is next to oil of balsam, or a little hotter; and is of service in all cold diseases, especially of the nerves. The distil'd oil of turpentine, taken inwardly, is of singular efficacy in nephritic pains." HOFFMANN—*Diss. de terebinthina*, (1699.) Supplementum, Pars Prima, p. 746, Ed. cited p. 681, *supra*—counselled caution in its use, especially if the patient be constipated or plethoric. BOERHAAVE—T. II, p. 95, *op. cit.*, p. 706, *supra*—wrote of this oil: "When used internally, it also proves aperitive, heating, sudorific, and diuretic, communicating a quick smell of violets to the urine;" and adds: "It must however be used with caution, because if taken too largely it affects the head, occasioning heat and pain therein, and also proves violently diuretic, and occasions an effusion of the liquor of the prostate glands and the semen, and, therefore, if used with moderation, it excites venery." He also insists upon the antiseptic virtues of this oil; bodies plunged into it "whilst contained in glasses, are preserved perfectly uncorrupted." Turpentine itself, as well as the balsams, had long enjoyed deservedly the reputation of being antiseptic. Thus FERNELIUS—*Therapeut. universalis*, Lib. V, Cap. 25, p. 271, *op. cit.*, p. 673, *supra*—wrote: "Terebinthina calefacit, mollit, discutit, terget, expurgat: viscerum omnium, maximeque renum, obstructiones tollit, et angustos meatus aperit, urinam ciet, putredinem cohibet." Indeed, the use made of various balsams and terebinthinates in embalming shows how old the knowledge of this property was. MURRAY—T. I, p. 20, *op. cit.*, p. 752, *supra*—wrote of the oil of turpentine: "Interne rarissime usurpatur, et cautionem requirit."

† BENJ. RUSH—*An account of the bilious yellow fever, as it appeared in Philadelphia, in the year* 1805, Med. Inquiries and Obs., Vol. IV, 4th Ed., Philadelphia, 1815, p. 96: "The only new medicine that the experience of this year suggested in this disease, was for one of its most distressing and dangerous symptoms, that is, the vomiting which occurs in its second stage. Dr. Physick discovered, that ten drops of the spirit of turpentine, given every two hours, in a little molasses, or syrup, or sweet oil, effectually checked it in several instances, in patients who afterwards recovered." This would seem to fix the date, yet STILLÉ—Vol. I, p. 759, *op. cit.*, p. 711, *supra*—citing the same passage, writes: "It was first used by Dr. Physick of Philadelphia in 1798." I know not where he got this date; certainly RUSH—Vol. cited, p. 39 *et seq.*—does not in any way allude to this treatment in his account of the epidemic of 1798.

‡ N. CHAPMAN—*Discourses on the Elements of Ther. and Mat. Med.*, Vol. II, p. 170, Philadelphia, 1819—after mentioning PHYSICK'S practice, writes: "The stomach in yellow fever, at the period the turpentine is prescribed, is in the state of inflammation approaching gangrene, and by the arrestation of which, I presume, it operates so advantageously. Exactly under similar circumstances of peritoneal inflammation, which partakes much of the nature of gastritis, I have now for a number of years prescribed the medicine, and with unequivocal advantage. Nor do I believe it to be less suited, though my experience in this respect is narrower, to the same state in enteritis, whatever may be the cause, whether induced in the ordinary way, or by acrid poisons, or associated, as it sometimes is, with dysentery." He adds: "In the low fevers, when other diffusible stimuli are given, much may be expected from turpentine. It was a common remedy with me in the sinking condition of our winter epidemic, and I had, in some instances, much reason to be satisfied with its effects." This view was quite in accordance with the teachings of CULLEN, who held—Vol. II, p. 181, *op. cit.*, p. 740, *supra*—that the oil of turpentine "seems to be a very diffusible stimulus." In the fourth edition of the work just cited—Vol. II, 1825, p. 131—CHAPMAN praises the use of the oil of turpentine also in cholera infantum, and adds: "In chronic diarrhœa, with such discharges as denote the mucous coat of the intestines to be chiefly affected, it is an incomparable remedy."

§ JAMES COPLAND—*A memoir on the employment of terebinthinous remedies in disease*, The London Med. and Phys. Jour., Vol. XLVI, 1821, p. 196.

‖ CHEYNE—see p. 709, *supra*.

¶ See, for the views of WOOD on the use of turpentine in typhoid fever his essay *On the use of the oil of turpentine, in a particular condition of fevers*, The North American Med. and Surg. Jour., Vol. I, 1826, p. 272; also the various editions of his treatises on the *Practice of Medicine*, and on *Therapeutics and Pharmacology*. A discussion of this subject would be out of place here. For his teachings with regard to its use in dysentery, see Vol. I, p. 575, of the first edition of his *Practice*—cited p. 691, *supra*—and the corresponding passages in subsequent editions. I cite the following striking paragraph from his *Therapeutics and Pharmacology*, 2d Ed., Philadelphia, 1860, Vol. I, p. 566: "*Dysentery and Diarrhœa.* Whenever, in the course of these complaints, whether acute or chronic, the tongue exhibits a smooth surface, as if deprived of its papillary structure, and at the same time becomes perfectly dry, I always unhesitatingly employ the oil of turpentine, believing that this aridity indicates a deficiency of the vital forces, which calls for the stimulating property of the oil, while the probable existence of ulcers in the bowels requires its alterative action."

certain quarters that it might be advantageously employed as an alterative to the mucous membrane, or almost as a specific in all stages of dysentery; a view well illustrated by the papers of Long and Campbell.*

Accordingly, during our civil war the oil of turpentine was pretty extensively employed in the treatment of the fluxes, both in combination with purgative doses of castor oil and in emulsion, with a view to its stimulant and alleged alterative effect.† A few expressions of favorable opinion with regard to it will be found in the reports, but I have been unable to collect any detailed evidence that it ever manifested any decided power in checking or beneficially modifying the progress of these disorders. It frequently irritated the stomach and provoked nausea and vomiting; often the number of the discharges was increased under its use; and even when it was tolerated it was only too common for the grave ulcerative cases, for which it was supposed to be especially suited, as well as those in which no ulcers existed, to terminate fatally in spite of its employment, as is strikingly illustrated by a number of the cases recorded in a previous part of this chapter.‡ I know of no reason for believing that the relative mortality of those thus treated was any less than that of similar cases treated in other ways; nor have I been able to gather, from modern investigation into the physiological action of the oil of turpentine, any evidence in support of the view that it is really serviceable as a local alterative in either inflamed or ulcerated conditions of the intestinal mucous membrane.

The latter observation may be made with regard to all the other drugs belonging to the group under consideration. The belief that they possess these virtues is so venerable, and has been shared by so many reputable practitioners in ancient and modern times, that it would be bold, and perhaps erroneous, to declare that it is entirely unfounded; yet candor compels the statement that it is unsupported by scientific evidence. The other belief, which has become more and more universal in modern times, that the oil of turpentine is a cardiac and nervous stimulant, undoubtedly rests upon a sounder foundation; but very little is positively known of the manner in which it acts,§ and the clinical testimony in our possession by no means fixes accurately the limits of its usefulness. I suppose no one would seriously propose it as a substitute for alcohol in low febrile conditions, and I know of no clinical evidence which clearly proves that by employing it in addition to alcohol better results can be obtained than by alcohol alone.

*Camphor*, unknown to Greek and Roman medicine, is described by Serapion, Avicenna and other Arabian writers, who classed it among the cold and dry remedies, believed it to possess a certain degree of astringency, and regarded it therefore as a useful addition to the

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* JOHN LONG—*Turpentine in dysentery*, St. Louis Med. and Surg. Jour., Vol. X, 1852, p. 209. CAMPBELL—Vol. XIV, 1858, p. 160 *et seq.*, *op. cit.*, p. 402, *supra*: "The remedy, which we prefer to all others, as the safest, the best, and most efficient in its operation upon the affections of the mucous tissue in general; and which, besides being of the most general applicability in the affections of this tissue—is pre-eminently to be chosen as the agent for the treatment of dysentery. This remedy is TURPENTINE." He gives the oil of turpentine in emulsion in combination with compound spirit of lavender, camphor water, bicarbonate of soda and castor oil; attaching great importance to the latter ingredient both as a laxative and a means of "anointing the interior surface of the intestinal canal"—p. 165. In this place I may conveniently refer also to the paper of J. W. MOORMAN—*Oleum Erigerontis Canadensis as a remedy in hemorrhage, diarrhœa and dysentery*, The Amer. Jour. of the Med. Sci., Vol. L, 1865, p. 396.

† As to the employment of oil of turpentine in combination with castor oil, see p. 709, *supra*. With regard to its use in small doses, see the reports in Section II of STORROW—p. 43, *supra*; SCHÜSSLER—p. 44; COUES—p. 64; BROWN—p. 81; WALTON—p. 88; COOPER and COOK—p. 93. This use of the oil was not mentioned in the handbook of TRIPLER—*op. cit.*, p. 691, *supra*—or the tract of STILLÉ—*op. cit.*, p. 650, *supra*; nevertheless I have reason to believe, both from observation and from conversation with medical officers, that it was resorted to more generally than appears from the reports.

‡ As illustrations, I may refer to cases 178, 188, 194, 219, 232, 234, 235, 241, 242, 243, 244, 245, 246, 247, 254, 307, 425, 468, 496, 518, 522, 536, 540, 547, 570, 589, 590, 591, 609, 611, 614, 639, 672, 689, 696, 784, 788, 789, 797, 819, 855 and 857.

§ For summary accounts of the present condition of our knowledge on this subject, see H. C. WOOD—p. 126, *op. cit.*, p. 675, *supra*—and BUCHHEIM—*loc. cit.*, p. 815, *supra*. Among the special essays I have examined with interest, I may mention those of HOPPE—*Die Nervenwirkungen des Terpenthinöls*, Jour. für Pharmacodynamik, Toxicologie u. Ther., Bd. I, 1856, S. 105 *et seq.*; LÉON CRUCIS—*Action physiologique et morbide de la térébenthine et de quelques autres hydrocarbures*, Paris Thesis, No. 155, 1874; and C. BINZ—*Ueber einige Wirkungen ätherischer Oele*, Archiv für experimentelle Path. u. Pharm., Bd. V, 1876, S. 109, and Bd. VIII, 1877-8, S. 50.

medicines prescribed in the alvine fluxes, and especially in such as proceed from an excess of bile.* These opinions prevailed through the middle ages. As late as the middle of the sixteenth century Fernelius still taught, like the Arabians, that camphor is cold and dry in the third degree;† and although Ambroise Paré employed it in gangrene, and recommended that it should be added to the alexipharmics administered in the plague, he expressly stated that he did so on account of its refrigerating properties.‡ Subsequently it acquired the reputation of being itself an alexipharmic, and of possessing the power of resisting putrefaction in a wonderful manner.§ Accordingly it was employed in the plague and in pestilential fevers by Mindererus, Diemerbroeck, Ettmüller, Hoffmann, Huxham and others.‖

Meanwhile, early in the seventeenth century, the Arabian dictum that camphor is a cooling remedy became a subject of controversy, and the opinions of those who held that it is really possessed of calefacient virtues temporarily secured the victory.¶ But this change of opinion does not appear to have modified materially the frequency with which it was administered both in putrid fevers and in the fluxes. Attention was directed, however, more and more to its antiseptic virtues, the belief in which was greatly strengthened by the experiments made by Pringle about the middle of the last century;** while at a later period the old controversy as to whether it is heating or refrigerant was revived by Cullen, who, however, put the question in other words, and asked whether it is stimulant or sedative, warmly advocating the latter view.†† The discussion of this question has been continued almost to the present day; but it is unnecessary to trace its progress here, or to sketch the history of the modern use of the drug in the low forms of fever. Its reputation in the latter group of diseases has given it some vogue in adynamic dysenteries and those complicated

* SERAPION—Cap. 334, *fol.* 177, *op. cit.*, p. 806, *supra:* "Et camphora quidem est frigida et sicca in tertio gradu, confert calefactis, et patientibus fodam cholericam, quando odoratur simplex, aut cum aqua rosacea, aut sandalis confectis, et odor camphoræ abscindit desiderium coitus. Sed potio ipsius est fortioris operationis, et quando miscetur ex ea quantitas pauca cum medicinis stringentibus fluxum ventris cholericum, fit ejus operatio melior." Moreover, camphor restrains undue warmth of the cerebrum, and thus produces sleep, checks hæmorrhages from the nose, may be advantageously combined with substances used for fumigation, and either by its vapor or taken internally is useful in all diseases proceeding from the hot temperament. But as a consequence of these qualities, if it be taken to excess, it chills the kidneys and bladder, congulates the sperm and generates frigid diseases, especially in cold climates: moreover, its use causes the hair to turn gray. AVICENNA—Lib. II, Tract. 2, Cap. 133, p. 291, Ed. cited p. 632, *supra*—held substantially the same views: "Abscindit coitum, et generat lapidem renum, et vesicæ, et constringit fluxum ventris cholericum." He also speaks favorably of its use in fevers. The belief of SERAPION that the mere odor of camphor destroyed the sexual appetite is perpetuated in the old rhyme: "Camphora per nares castrat odore mares:" see DALE—p. 300, *op. cit.*, p. 729, *supra*.

† FERNELIUS—*Meth. Med.*, Lib. VI, Cap. I, p. 275, *op. cit.*, p. 679, *supra:* "Caphura frigida sicca gradu tertio, lacryma indicæ arboris, tenuium partium, aeris et odora repellit et facile penetrat: phlegmonas et erysipelata refrigerando mire juvat, ad gonorrhœam et albas vulvæ fluxiones efficax, cum succino e convenienter liquore hausta."

‡ AMBROISE PARÉ—Lib. XXIV, *De la peste*, Malgaigne's Ed. of Œuvres, T. III, Paris, 1841, Chap. 24, p. 406. After speaking of the use of therinea and the antidote of MITHRIDATES in the plague, he writes: "Vray est que quand la fiéure est fort grande, il les faut mesler auec choses refrigerantes, comme trochisques de camphre (lequel mesme preserue le corps de pourriture, et pource est commodément meslé és antidotes contre la peste)," &c.

§ See, for example, FAB. HILDANUS—*De gangræna et sphacelo*, 1593; I cite Opera, Frankfort, 1646, p. 787: "Camphora enim inter fortissima alexiteria non immerito a viris doctis numeratur: putredini enim mirum in modum resistit. Quapropter non solum vapores, qui ex corrupto et putrefacto membro versus cor ascendunt, repellit; verum etiam maximum illum calorem internarum partium temperat." It will be seen that he still holds to the notion that it is a cooling remedy. I may add that FERNELIUS—Lib. V, Cap. 21, p. 266, *op. cit.*, note †, *supra*—had previously written: "Caphura malignos vapores, præsertim calidos, extinguit, ab hisque ortam sensuum exolutionem reparat."

‖ R. MINDERERUS—*De Pestilentia*, Cap. 15, p. 197 of the copy in our library, which is without date, but which I suppose to be the Augsburg Ed. of 1619: "Proindeque camphoram inter fortissima ac validissima pestis alexiteria non immerito reponuerim sive frigida hæc sit sive calida." I. DE DIEMERBROECK—*De Peste*, Lib. III, Cap. 5, Arnheim, 1646, p. 162 *et seq.* In the annotations to this chapter—p. 170—he repeats the praises of MINDERERUS and others. ETTMÜLLER—*Institut. Med. Therapeutice*, Pars I, Cap. 17, T. I, p. 227, Ed. cited p. 647, *supra*—in speaking of the treatment of the plague, writes: "Præterea subinde laudavi campheram, quæ certe in peste curanda omnibus præfertur." F. HOFFMANN—*Diss. med. de camphoræ usu interno securissimo et præstantissimo*, 1714; I cite Opera, T. VI, p. 63, Ed. cited p. 681, *supra:* "Quicunque itaque malignos contagiosos corpore arcere vult morbos, is vel ipsum putridum miasma, vel quod ab ipso corruptum fuit, ex corporis nostri sphæra propellere omni studio atque opera nitatur. Nihil vero ad hoc præstandum aptius est camphora." See also J. HUXHAM—*De febribus*, 1739, T. II, p. 116, *op. cit.*, p. 659, *supra*.

¶ See, on this subject, SENNERTUS—Lib. IV, Part 2, Sect. 3, Cap. 5, Vol. III, p. 581, *op. cit.*, p. 645, *supra—Quæstio. An camphora sit frigida vel calida, et an Venerem exstinguat.* It has been held to be frigid, he says, because it is useful in pains of the head, inflammation of the eyes and the like, and because it extinguishes the sexual desire. But others believed it to be heating, because it excites inflammations and is of a thin, penetrating substance and acrid taste. He himself regards the latter opinion as most in accord with the truth. The same view of the question was taken by J. A. WEDEL, as cited by MANGETUS—T. I, p. 458, *op. cit.*, p. 736, *supra*—and DALE—p. 300, *op. cit.*, p. 729, *supra*.

** In these experiments, read before the Royal Society, June 28, 1750—see note *, p. 803, *supra*—PRINGLE found that "two grains of camphire, mixed with water, preserved flesh better than sixty grains of sea-salt:" see Appendix, p. xii, *op. cit.*, p. 649, *supra*. He used this drug both in inflammatory fevers—p. 129, *op. cit.*—and in hospital fever—pp. 310 and 316; but appears to have made no use of it in either diarrhœa or dysentery.

†† CULLEN—Vol. II, p. 292, *op. cit.*, p. 740, *supra:* "The controversy has been commonly brought into the single question, Whether camphire be a heating or a cooling medicine with respect to the human body? or, as I would put it in other words, Whether it is a stimulant or a sedative power?"

with typhoid fever. It has been recommended in these conditions by Tissot, Zimmermann, Birnstiel, Schumacher, Hauff and others; while Sponitzer and Mende regarded it as useful also in the simple catarrhal forms of the disease.* Annesley held it to be a valuable adjuvant in the treatment of tropical dysentery. He believed that it possessed the power of determining to the skin and of diminishing vascular action, while at the same time it controlled the tendency to spasm without retarding the operation of purgative medicines.† On the other hand, Naumann reported that in nervous putrid dysentery the effects of camphor and opium seldom corresponded to his expectations, and Fouquet declared that he was unable to discover a single reason in favor of its employment either in the so called putrid or any other dysenteries.‡

Many of the best modern writers on dysentery preserve a contemptuous silence with regard to the use of this drug; but it must be admitted that in certain quarters the sanguine views of Annesley still survive. Nevertheless, for the most part in modern, as in ancient, times camphor has been regarded rather as a useful addition to the more powerful drugs usually employed in the treatment of dysentery or other forms of flux than as a remedy that can be relied upon alone. It has been added to the most diverse anodyne and astringent mixtures and pills, and has especially been employed in combination with opium. Pills of camphor and opium have had considerable popularity in the treatment of simple diarrhœa. Such pills, containing each two grains of camphor and one of opium, figured in the medical supply table of our army during the civil war, and nearly half a million dozen of them were purchased for issue.§

Modern investigation into the physiological action of this drug seems to indicate that it resembles in many respects that of oil of turpentine and the volatile aromatic oils.‖ Like them, it is a local irritant capable in excessive doses of producing gastritis, though less active in this direction than most of the essential oils; like them, in moderate doses it appears to stimulate the vascular and nervous systems, while poisonous quantities produce vertigo, headache, delirium, epileptiform convulsions, unconsciousness and death.¶ The question of its real utility in the fluxes is one that still requires further study. Some

* TISSOT—*loc. cit.*, note ¶, p. 797, *supra*. ZIMMERMANN—Cap. X, S. 476, *op. cit.*, p. 648, *supra:* "Nach der Peruvianischen Rinde oder in dem gleichen Range mit derselben, kann man sich in der bösartigen Ruhr zur Emporhebung der Kräfte des Campfers bedienen." It may be very conveniently joined to the extract of bark, and even with ipecacuanha. BIRNSTIEL—Sect. VII, S. 300, *op. cit.*, p. 770, *supra*—commended it in dysentery complicated with putrid fever; F. SCHUMACHER—*Beyträge zur Nosogenie und Nosologie der Ruhr*, Frankfort, 1813, S. 186—in the typhous form of dysentery; and HAUFF—S. 453, *op. cit.*, p. 534, *supra*—in secondary typhous and nervous paralytic dysentery. SPONITZER—*Von den Wirkungen des Camphors in verschiedenen Krankheiten und den Cautelen bey der Anwendung desselben*, Hufeland's Jour., Bd. V, St. 3, 1798, S. 546—found it even useful in simple rheumatic (catarrhal) dysentery, but especially in putrid cases in which there was great loss of strength. In the Luxemburg epidemic of 1793 he gave with advantage two to three grains every three hours, often combined with Sydenham's laudanum and Peruvian bark. L. MENDE—*Epidemische Gelbsucht in den Jahren 1807 und 1808*, same Jour., Bd. XXXI, St. 8, 1810, S. 88—gave it in simple rheumatic dysentery and in cases complicated with intermittent fever, and regarded it as one of the chief means of cure.

† ANNESLEY—Vol. II, p. 297, *op. cit.*, p. 621, *supra*—remarks that he "generally found it most useful in conjunction with other remedies, given in repeated doses, and in combination with anodynes and laxatives." He thought the dose should not exceed two or three grains early in the disease; but that it might be increased to five or six in the advanced stages.

‡ NAUMANN—Bd. IV, Abth. 2, S. 97, *op. cit.*, p. 645, *supra*. FOUQUET—p. 196, *op. cit.*, p. 753, *supra*.

§ According to the report of Surgeon SPENCER—cited note †, p. 708, *supra*—the number of these pills purchased for issue was 448,895 dozen. As each consisted of two grains of camphor and one of opium, the total quantity of gum camphor contained in them was 1,539 lbs., (avoirdupois.) To this must be added the quantity of paregoric mentioned in note ‡, p. 743, *supra*, viz, 993,311 ounces, which contained about 177 lbs. of camphor. Surgeon SPENCER furthermore gives the quantity of gum camphor purchased in substance as 924.184 ounces, or 57,761 lbs., (avoirdupois;) of course a large part of this supply was employed in making soap liniment and for other external uses. It will be observed that the total supply of gum camphor amounted to very nearly 30 tons, (of 2,000 lbs. each.) Surely if the old Arabian dream were true, the quantity was sufficient to have at least preserved the chastity of the army, even if its fluxes were not cured.

‖ See, for an account of these investigations, the work of the HUSEMANNS—S. 975, *op. cit.*, p. 766, *supra;* H. C. WOOD—p. 192, *op. cit.*, p. 675, *supra;* and BUCHHEIM—S. 561, *op. cit.*, p. 746, *supra*. Among the special papers I have examined with interest I may mention those of A. MALEWSKI—*Quædam de camphora, carbonco sesquichlorato, cumarino vanillaque meletemata*, Diss. Inaug., Dorpat, 1855; O. HEUBNER—*Ueber die Wirkung des Kamphers auf die Leistung des Froschherzens*, Archiv der Heilkunde, 1870, S. 334; E. ZIEGLER—*Ueber das Verhalten des Campheroymols im thierischen Organismus*, Archiv für experimentelle Path. und Pharm., Bd. I, 1873, S. 65, (which treats of the chemical changes this substance undergoes in the organism;) and the two papers of BINZ, cited note §, p. 818, *supra*.

¶ On the toxic action of camphor, see, besides the works cited in the last note, ORFILA—T. II, p. 639, *op. cit.*, p. 699, *supra;* TAYLOR—p. 661, *op. cit.*, p. 791, *supra;* and other treatises on toxicology.

excellent recent writers acknowledge that its employment in the adynamic fevers is of doubtful advantage;* and the evidence that it produces any decided benefit in diarrhœa or dysentery is still less conclusive. Certainly I should be unwilling to rely upon it as a stimulant in adynamic dysenteries; and although no doubt the painful cramps that often accompany slight intestinal catarrhs can frequently be allayed by it, it may well be questioned whether it is the best remedy to select for this purpose.

ANTISEPTIC REMEDIES.—In connection with a number of the medicaments hitherto discussed, reference has been made to their supposed virtues as antiseptics capable of arresting the putrefaction of the humors, or as parasiticides acting by compassing the destruction of the imagined living cause of the disease. Calomel, Peruvian bark and quinia, the simple and aromatic bitters, strychnia, the mineral acids, turpentine and camphor are among the principal substances that have been selected with this view. The modern speculation, that the cause of the septic processes that occur in disease is to be sought in the bacteria and other low forms of vegetable life, which develop during their progress, has led to a general revival of therapeutic effort in this direction. Besides the substances already mentioned as having been employed with such views, particular attention has been directed to *carbolic acid*, the employment of which was preceded by favorable reports of the usefulness of *creasote* in diarrhœa and dysentery.† Carbolic acid has been used internally in these diseases by Rothe, Amelung, Thoresen and others,‡ while the *sulphocarbolate of calcium* has been employed by Sansom in the diarrhœa of children for the same purpose.§ Wagner and others have resorted instead to *salicylic acid*;‖ and *chlorine water* has been advocated by Dyes and Schneider.¶

It would be perhaps premature to enter upon a detailed discussion of the question of the propriety of such attempts. I confess, however, I have no confidence whatever in the utility of this mode of medication. I have already endeavored to show** that the facts hitherto brought forward in support of the theory that the fluxes are caused by low vegetable forms are insufficient to demonstrate its truth. It is at best a plausible speculation which the enthusiastic may accept as an article of belief, but the prudent will decline to elevate above the rank of an undemonstrated hypothesis.†† Even if this speculation were proved

* For example, my friend H. C. WOOD—*loc. cit.*, note ‖, last page—writes: "In adynamic fevers it has been very greatly employed, but is of doubtful advantage: still, a good deal of testimony could be adduced in favor of its usefulness in sustaining the system in the low stages of these diseases; and in nervous restlessness occurring at such times it is often very soothing."

† On the use of *creasote* in diarrhœa and dysentery, see the following essays: J. A. MAYES—*Cases of diarrhœa, with emaciation, coming on after weaning, successfully treated with creosote*, Southern Med. and Surg. Jour., Vol. II, 1846, p. 583; and *Application of creosote to the treatment of diarrhœa and dysentery*, same Jour., Vol. III, 1847, p. 147; C. N. SPINKS—*On the use of creosote in the treatment of diarrhœa*, The London Med. Gaz., Vol. IX, 1849, p. 254; W. B. KESTEVEN—*Beneficial effects of creosote in the treatment of diarrhœa*, same Jour., Vol. XII, 1851, p. 235; W. H. MCMATH—*Creosote in dysentery, with cases*, Southern Med. and Surg. Jour., Vol. XIII, 1857, p. 579; J. W. BROWN—*Creasote in dysentery*, Nashville Jour. of Med. and Surg., Vol. XIII, 1857, p. 306; J. B. PAYNE—*An essay on the ætiology, pathology, and treatment of epidemic dysentery*, The New Orleans Med. and Surg. Jour., Vol. XV, 1858, p. 93; J. JOHNSON—*Treatment of diarrhœa*, The Med. Times and Gaz., 1867, Vol. II, p. 138; and G. B. LABTIGUE—*Creasote in cholera*, Philadelphia Med. Times, Vol. II, 1871–2, p. 8. Here, too, I may refer to the use of *naphtha* in diarrhœa by J. C. LAVIROTTE—*Emploi de l'huile de naphte dans la diarrhée*, Gaz. des Hôpitaux, 1849, p. 46.

‡ On the internal use of *carbolic acid* in diarrhœa and dysentery, see S. O. HABERSHON—*Functional disease of the colon*, &c., The Lancet, 1868, Vol. I, p. 7; C. G. ROTHE—*Carbolsäure innerlich gegen Diarrhœn und Cholera*, Berliner klin. Wochenschrift, 1871, S. 537—and *Die Carbolsäure in der Medicin*, Berlin, 1875, S. 37 *et seq.*; AMELUNG—*Zur Behandlung der Dysenterie*, Berliner klin. Wochenschrift, 1873, S. 125; and N. W. THORESEN—*Zur therapeutischen Verwendung der Carbolsäure*, Norsk Mag., Vol., IX, 1875, S. 449; I cite from Schmidt's Jahrb., Bd. CLXIX, 1876, S. 122.

§ A. E. SANSOM—*On some new double salts of carbolic acid*, &c., Medico-Chirurgical Trans., Vol. LII, 1869, p. 139; and *On the sulpho-carbolates in the treatment of certain diseases of children*, Trans. of the Obstetrical Society of London, Vol. XII 1870, p. 12.

‖ W. WAGNER—*Praktische Beobachtungen über die Wirkung der Salicylsäure*, Kolbe's Jour. für prakt. Chemie, Bd. XI, 1875, S. 60: see, also, *St. Francis's hospital. Treatment of dysentery with salicylic acid*, The New York Med. Jour., Vol. XXIII, 1876, p. 173.

¶ A. DYES—*Die rationelle Behandlung der Ruhr*, Deutsche Klinik, Bd. XXII, 1870, S. 274 *et seq.*; SCHNEIDER—S. 29), *op. cit.*, p. 513, *supra*.

** See pp. 278 *et seq.*, 367 *et seq.* and 643 *et seq.*, *supra*.

†† As I write this paragraph I have before me a paper by Prof. JOHN TYNDALL—*Virchow and evolution*, The Popular Science Monthly, January, 1879, p. 288 *et seq.* in which that agreeable and usually instructive lecturer fiercely attacks the conservative views expressed by VIRCHOW in his address at Munich, September 22, 1877—*Die Freiheit der Wissenschaft im modernen Staat*, Berlin, 1877, S. 15 *et seq.*—on the question of contagium animatum. Professor TYNDALL in this century, like DES CARTES in the seventeenth, appears to imagine that his acknowledged meritorious attainments in certain branches of physical science justify him in expressing quite positive opinions on almost any subject, religious or scientific, he may care to discuss, without

to be true, it still remains to be shown that any of these substances can be introduced into the blood in such quantities as to prevent the experimental or pathological development of the low forms in question, or even that they can be administered without peril to life in sufficient quantities to destroy the vitality of the similar forms that habitually swarm in the lower part of the alimentary canals of healthy individuals.*

OTHER MODES OF TREATMENT.—It remains to refer briefly to a few other remedies which have enjoyed popularity in the treatment of the fluxes. Here may be mentioned *arnica*, which was lauded as a remedy in dysentery by Collin, Stoll, Birnstiel and Richter during the last century, and which, at a comparatively recent period, Savignac has suggested is perhaps worthy of a place in the therapeutics of that disease.† It is, however, seldom employed by modern physicians for this purpose, and the little that is really known of its mode of action is hardly favorable to any attempt to revive its use.‡

*Ergot*, in powder or fluid extract, as well as the extract which Bonjean improperly called ergotine, has been used to a limited extent in dysentery and chronic fluxes. Successful results had been reported by Gervis, Rillet and Lombard, Fontayral and others; but it was especially the success claimed for it by Massolaz in the fluxes of the Sardinian army during the Crimean war which brought it into temporary repute.§ His observations

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the necessity for any particular investigation of it. In this matter, although I think he is rather too liberal in his concessions to the modern disciples of the contagium animatum, I respect the opinions of VIRCHOW as the ripe utterances of a great intellect devoted now for many years to the study of disease; but I can attach no more importance to those of TYNDALL than to his speculations on any other subject not embraced in his own particular field of personal investigation. Indeed, I do not hesitate to express the opinion that, in the actual condition of scientific inquiry on the subject, the reception of the doctrine of contagium animatum as a general theory of epidemic and contagious diseases requires on the part of the believer an act of faith quite as great as that which Professor TYNDALL explains in the same paper—p. 271—he has found it so impossible to exercise with regard to "the eternal Sonship of Christ," "the resurrection of the body" and other doctrines of the Christian religion.

* In this place I may mention the use of *santonin* in Cochin China diarrhœa, a practice suggested by the view of NORMAND—see pp. 372 and 757, *supra*—that the disease is caused by an anguillula: see L. COLIN—*Diarrhée de Cochinchine; guérison par la santonine*, Gaz. Hebd., T. XV, 1878, p. 132. The suggestion is at least consistent with the theory. After the parasiticides, vermifuges!

† According to SPRENGEL—Bd. IV, S. 545, *op. cit.*, p. 346, *supra*—the *arnica montana* was well known to the botanists of the sixteenth century, and was long employed as a popular application to bruises before it was brought into medical use. Probably the earliest account of its virtues, when given internally, is that of J. M. FEHR—*De arnica lapsorum panacea*, Misc. Cur. German., Dec. I, an. 9 et 10, 1678–9, Obs. 2, p. 22—who declares it to possess acrimony and an aromatic virtue, to be diuretic and sudorific, useful in catarrh, asthma, colic, hysterical pains, in slow fevers, &c. It was lauded by H. J. COLLIN—*Obs. circa morbos acutos et chronicos factarum Pars IV*, Vienna, 1773, pp. 5, 79 and 107, *Pars V*, 1775, pp. 132, 209, 263 and 323—whose work, I regret to say, is not in our library. SPRENGEL, from whom I cite the above reference, states in the first edition of his history—Bd. V, Halle, 1803, S. 352—that asthenic diarrhœas and putrid dysenteries were among the diseases for which he employed it: this passage is omitted in the third edition of SPRENGEL'S work. According to STOLL—*Rationis Medendi Pars I*, Vienna, 1788, p. 125—COLLIN used no evacuants in the treatment of dysentery, but relied upon arnica alone. STOLL himself—*Pars II*, p. 369, *op. cit.*—regarded arnica root as possessed of antiseptic virtues, and writes: "Nullum certe medicamentum novi, quod specifici antidysenterici compellationem majori sibi jure possit vendicare." He regarded it as especially useful in the fluxes that so often accompany malignant fevers, in diarrhœas proceeding from debility of the abdominal viscera, and in the colliquative diarrhœas of those laboring under purulent discharges, as well as in dysentery. In camp dysentery it is especially valuable, and will so be recognized by those who manage the sanitary affairs of armies in future times. What a benefit it would be to military medicine if the great antiseptic powers of this medicament were more generally known! In June, 1777, he treated about 20 cases of dysentery successfully by this remedy, an emetic having first been administered—p. 46. He commends it especially in the varieties of dysentery he called *febris biliosa dysenterica* and *febris putrida dysenterica:* in the latter form he gave as much as half a drachm of the powder of the root every two or three hours—*Pars III*, p. 266 *et seq.* Nevertheless in the simple dysenteries of August, 1778, it was injurious—p. 252. As for arnica flowers, they exercise their specific powers chiefly upon the stomach, and are useful especially in putrid fevers of gastric origin—p. 159 *et seq.:* he did not employ them in dysentery. BIRNSTIEL—p. 237, *op. cit.*, p. 770, *supra*—cites with admiration the views of STOLL as to the use of arnica root in dysentery; he himself appears to have preferred—p. 286—an infusion of arnica flowers, to which he added vinegar and syrup of althæa. RICHTER—Bd. I, S. 103, *op. cit.*, p. 731, *supra*—declared that arnica acts in a really wonderful manner in dysentery when the evacuations have an offensive odor and there is great debility. SAVIGNAC—p. 396, *op. cit.*, p. 620, *supra*—writes: "Inscrivons donc, sous toutes réserves, la poudre de racine d'arnica (et non les fleurs, comme le disent certains auteurs) dans le formulaire thérapeutique de la dysentérie."

‡ See, on this subject, the work of the HUSEMANNS—S. 939, *op. cit.*, p. 766, *supra;* H. C. WOOD—p. 157, *op. cit.*, p. 675, *supra;* and BUCHHEIM—S. 578, *op. cit.*, p. 746, *supra*. On account of the volatile oil contained in this plant the last named author treats of it in his "Gruppe des Terpenthinöls." STILLÉ—Vol. I, p. 701, *op. cit.*, p. 711, *supra*—classes arnica among the general stimulants, while H. C. WOOD—*loc. cit.*—regards it as a cardiac sedative, partly from the symptoms in some cases of poisoning, of which, however, he only claims that they "seem in a measure to bear out this view," but chiefly, it would appear, on the basis of the clinical observations of C. C. BALDING—*On the value of tincture of arnica in the treatment of acute pulmonary affections*, The Lancet, 1870, Vol II, p. 885.

§ F. S. GERVIS—*Use of ergot of rye in dysentery*, The Lancet, 1846, Vol. II, p. 39—reports a case with bloody discharges in which he successfully used Battley's solution of ergot with tincture of sesquichloride of iron. According to J. BONJEAN—*Emploi de l'ergotine chez les malades et les blessés de l'armée d'Orient*, Chambéry, 1855, p. 7—the epidemic of typhoid fever in Geneva in 1853 was accompanied by many cases of dysentery in which ergotine was used with success by RILLET and LOMBARD; and that FONTAYRAL (à Eymet) had published in the Jour. des Sci. Med. Pratiques de Montpellier, T. VI, 1854, p. 293, and T. VII, p. 242 *et seq.*, (the volumes are not in our library,) a series of observations on the successful treatment of chronic dysentery by the same medicament. MASSOLAZ—*Emploi de l'ergotine dans la diarrhée épidémique de l'armée Sarde en Orient, pendant l'été de* 1855, Répertoire de Pharmacie, T. XIII, 1856-7, p. 153: see also a brief note on this subject in the report of the proceedings of the Académie des Sci., Aug. 18, 1856, Gaz. Hebd., T. III, 1856, p. 620—used it with alleged success in the chronic diarrhœas of the Sardinian army in the Crimea. He mixed 1 to 2 grammes in 120 grammes of sweetened water, and gave a teaspoonful every half hour. A later work by FONTAYRAL—*Le seigle ergoté et de l'application de l'ergotine à la cure de la dysenterie et de la diarrhée chroniques*, Montpellier, 1858—is not in our library.

suggested its use to Tripler, who obtained success with it in several cases of chronic dysentery, and, although it failed in others, recommended that further trial should be made.* His counsels did not lead to its introduction into military practice during the civil war, but since then a number of favorable notices of its use in diarrhœa and dysentery have appeared in the journals, which, however, have not convinced me of the wisdom of this mode of treatment.† Savignac declares that he employed it a good deal, obtained no great advantages, and ended by renouncing it; yet thinks it may be useful as a hæmostatic in hæmorrhagic cases.‡ This view appears reasonable; but when the nature of the phenomena of ergotism is considered, the impropriety of exhibiting the drug continuously in the chronic fluxes will be apparent.§

The internal use of white *arsenic* in the fluxes, for which Harles so severely blamed the later Greek and Arabian physicians, has been revived in comparatively modern times.‖ The preparation used for this purpose is Fowler's solution. Tripler stated that he had employed it in several cases of chronic dysentery, and always with more benefit than any other remedy he had ever used.¶ His praise induced several of our medical officers to try it during the civil war; some of them reported favorable results, while others were disappointed.** It has since been recommended by Ringer in chronic dyspepsia complicated with diarrhœa, and in other chronic forms of flux.†† I do not doubt that in diarrhœas kept up by the malarial cachexia or complicated by ague the administration of this remedy has frequently been followed by beneficial results;‡‡ and it is possible, though hardly probable, that in other chronic fluxes its use in small doses may occasionally be followed by a beneficial modification of the condition of the intestinal mucous membrane. But the more I consider what is known of the effects of the persistent administration of this powerful drug in other diseases, the more I incline to the opinion that even in fluxes with malarial complication it would be better to rely upon quinia or other suitable medicaments than to invoke the treacherous assistance of a substance so prone to produce serious intestinal irritation. Those who have employed it with a view to its constitutional effects know well how apt it is to produce digestive disturbances and diarrhœa, even in those whose intestines are healthy. Is it at all probable that these accidents are less likely to occur when the intestinal mucous membrane is already inflamed or ulcerated?

Considerable interest was aroused in 1864 by the reported success of Acting Assistant Surgeon H. F. Gilbert in treating chronic fluxes with *bromine* and *iodine* at the Rock Island

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* TRIPLER—p. 35, *op. cit.*, p. 691, *supra*.

† See W. J. HILLS—*Secale cornutum in diarrhœa*, The Med. and Surg. Reporter, Vol. XX, 1869, p. 326; A. LUTON—*Note sur l'emploi de l'ergot de seigle contre la dysentèrie*, Gaz. Hebd., T. VIII, 1871, p. 610; A. PALMBERG—*Ueber die Wirkung des Secale cornutum bei chronischer Diarrhöe*, Finska läkaresällskapets handlingar, XIII, 2, p. 75, 1871; I cite from Schmidt's Jahrb., Bd. CLII, Jahrg. 1871, S. 20; C. HANDFIELD JONES—*Two cases of chronic dysentery, with remarks*, The Med. Times and Gaz., 1875, Vol. I, p. 657; and Q. C. SMITH—*Formulas for diarrhœa and dysentery in children*, Pacific Med. and Surg. Jour., Vol. VIII, 1874-5, p. 132: "℞ Fluid extract of ergot 3j, fluid extract of goldeu seal 3ss. Mix. To small children, give from half to one teaspoonful, at intervals of one to four hours, as the case may require. For dysentery, with bloody discharges." The number of children who may have survived this medication is not reported. See also E. T. COMEGYS, Assistant Surgeon U. S. A.—*Fluid extract of ergot in diarrhœa*, The Med. Record New York, Vol. XI, 1876, p. 565.

‡ SAVIGNAC—p. 390, *op. cit.*, p. 620, *supra*.

§ See, on the subject of ergotism, STILLÉ—Vol. II, p. 686, *op. cit.*, p. 711, *supra*.

‖ HARLES—*loc. cit.*, note 1, p. 763, *supra*.

¶ TRIPLER—*loc. cit.*, *supra*. He states that it was suggested to him some three years before by Dr. FOSTER of Cincinnati, who mentioned that "he had seen surprising results in a case of chronic diarrhœa, from the use of very small doses of Fowler's solution."

** The use of Fowler's solution in the chronic fluxes is spoken of favorably in the reports of STORROW—p. 43, *supra*; TAYLOR—p. 87; and FOOTE—p. 90. BROWN—p. 81—states that he was disappointed with it. H. N. FISHER—*loc. cit.*, p. 697, *supra*—remarks that some of the patients to whom he gave it improved, while others did not. C. H. RAWSON—*loc. cit.*, p. 744, *supra*—affirms that it often "acts admirably" in "continued diarrhœa."

†† SYDNEY RINGER—*Handbook of Therapeutics*, 2d Ed., London, 1871, p. 197, and 4th Ed., Amer. reprint, New York, 1875, p. 253; the 1st Ed., published in 1869, I have not seen—recommends it in a form of diarrhœa connected with chronic dyspepsia which "appears to depend on excessive peristaltic action of the stomach and intestines, whereby the food, before it is digested, is driven from the stomach to the intestines, and thence expelled." He adds: "Arsenic will often be found of service in other chronic forms of diarrhœa, even when due to serious organic disease, as the bowel ulceration of phthisis etc."

‡‡ I have previously expressed this view—p. 261, *op. cit.*, p. 606, *supra*, and *Circular No. 6*, p. 126, *op. cit.*, p. 571, *supra*—but was, I think now, to blame for referring to the use of arsenic in the fluxes without pointing out more clearly the dangers attending its use.

prison hospital. I have already presented conclusive evidence that the enthusiastic views which he entertained are not supported by the record; indeed, he collected his facts in so loose a manner that, as I have shown, some of the patients he supposed he had cured were already dead when he made his report. The views announced in his paper were not confirmed by subsequent experience in the Rock Island hospital, and the trials at Camp Dennison were also unsuccessful. Sound theoretical reasons for the internal administration of bromine or iodine in the fluxes have not been advanced, and the trial that has been made condemns them as useless if not actually injurious.*

*Chlorate of potassa* has recently been commended, both in diarrhœa and dysentery, by a few physicians,† but I know of no valid reasons for expecting benefit from its use.‡ Nor do I allude to *aconite* or *veratrum viride*, which have sometimes been employed to control the febrile symptoms in the early stages of acute dysentery, except for the purpose of advising the reader to avoid them.§

A variety of other substances have been recommended, of which some have become obsolete, while so little evidence has been advanced in behalf of others that it is unnecessary to discuss them.‖ Nor shall I attempt to enumerate all the ridiculous nostrums suggested by ancient or mediæval superstition, although it would be very easy to collect a great deal of curious information on this head did time and space permit.¶

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* See the report of GILBERT in Section II, p. 52, *supra*. He dissolved six drops of bromine with fifteen grains of bromide of potassium in an ounce of water and gave drachm doses every two hours, or gave ten-drop doses of a solution of two grains of iodine dissolved in water by means of iodide of potassium. The case book and hospital register of the Rock Island hospital have enabled me to expose the errors into which he fell—see p. 53 *et seq.*, *supra:* see, also, his paper, *Bromine in the treatment of diarrhœa and dysentery*, The Chicago Med. Examiner, Vol. V, 1864, p. 657. At a meeting of the surgeons on duty at Camp Dennison—*Proceedings of the Dennison Medical Society, Jan.* 17, 1865, The Cincinnati Lancet and Observer, Vol. VIII, 1865, p. 279—Dr. CHAPMAN stated that he had tested the bromine treatment "to a considerable extent, and that in the main he had been disappointed with the results; yet in a number of instances, it had acted very happily. He had not fully determined the peculiarities of the cases that were benefited. He was still investigating the subject." At the meeting of the same society March 7, 1865—*op. cit.*, p. 341—however, CHAPMAN modified this statement, saying, "he had tried the bromine treatment, but only one case was benefited by it." So far as I know, the only observations that appear to support GILBERT'S view with regard to bromine are related in one of the clinical lectures of my distinguished friend N. S. DAVIS (of Chicago)—*Chronic diarrhœa—Camp diarrhœa*, &c., The Chicago Med. Examiner, Vol. V, 1864, p. 561—who states that, having learned the method during a professional visit to Rock Island, he commenced using it immediately upon his return, and remarks, "thus far its effects have fully answered my expectations." It would appear from a subsequent publication—*Chronic army diarrhœa*, same Jour., Vol. XII, 1871, p. 157—that he was still using the bromine treatment as late as February, 1871; but I regard these reports rather as indications that my friend was impressed by Dr. GILBERT'S enthusiastic statements than as expressions of any very great experience with the remedy. I note also a favorable report with regard to the use of iodine in chronic diarrhœa by E. L. SHURLY (of Michigan)—*Compound solution of iodine in chronic diarrhœa*, Buffalo Med. and Surg. Jour., Vol. X, 1871, p. 302.

† A. B. ISHAM—*Dysentery. Successful employment of chlorate of potassa*, The Clinic, Vol. I, 1871, p. 184; E. Z. SHACKLETON—*Some further testimony in favor of the employment of chlorate of potash in chronic dysentery*, same Jour., Vol. II, 1872, p. 27; J. B. AMISS—*Chlorate of potash in dysentery in the adult and in inflammatory diarrhœa of infancy*, &c., The Med. Record, Vol. VII, 1872, p. 251; A. S. GATES—*Chlorate of potassa in bowel complaints*, The Amer. Jour. of the Med. Sci., Vol. LXVI, 1873, p. 283; C. BONFIGLI—see *Notizie di accademie società e congressi medici*, Il Movimento Medico-Chirurgico, anno VII, 1875, p. 78; MONCORVO—*Do emprego do chlorato de potassa na diarrhéa das crianças*, Revista Medica, (Rio de Janeiro,) anno II, 1874–5, p. 196.

‡ See, on the physiological action of this drug, H. C. WOOD—p. 472, *op. cit.*, p. 675, *supra*.

§ See the account of the use of aconite by MARLOT in the febrile stage of acute dysentery on board the "Crocodile" off the coast of Zanzibar in October, 1844, in an article entitled *Quelques mots sur le traitement de la dyssenterie, et en particulier sur l'emploi de l'aconit napel dans cette maladie*, Bull. Gén. de Thér., T. XXXVII, 1849, p. 105. With regard to *veratrum viride*, see, for example, A. M. RAGLAND—*Veratrum viride in dysentery*, The Medical Archives, (St. Louis,) Vol. IV, 1870, p. 279.

‖ I may mention here *pareira brava*, which, during the last century, enjoyed a short-lived reputation in the treatment of dysentery: see PLANQUE—T. IV, p. 22, *op. cit.*, p. 690, *supra; Collect. Acad.*, Partie François, T. III, 1769, p. 526; and GEOFFROY—T. II, 1743, p. 53, *op. cit.*, p. 707, *supra*. The *betel nut*, (fruit of areca catechu:) see F. PERON—*Sur la dyssenterie des pays chauds, et sur l'usage du bétel*, Corvisart's Jour. de Méd., Chir., Pharm., &c., T. IX, 1805, pp. 57 and 183. Powdered *gum guaiac:* see J. W. STERLING—*A new remedy in acute dysentery*, The New York Jour. of Med., Vol. I, 1848, p. 370. *Chloride of barium:* see A. WALSH—*Muriate of barytes in diarrhœa*, Dublin Med. Press, Vol. XIX, 1848, p. 322. *Glycerine:* see J. DAUDÉ—*Note sur un nouveau mode de traitement de la dysenterie*, L'Union Médicale, T. XI, 1857, p. 569. *Propolis:* see H. O. HITCHCOCK—*Propolis as a remedy for diarrhœas, acute and chronic*, The Chicago Med. Jour., Vol. XXIV, 1867, pp. 417 and 485. *Guarana:* see HERVÉ—*Emploi du guarana dans les diarrhées rebelles*, Bull. Gén de Thér., T. LII, 1857, p. 418. The *spinal ice-bag:* see JOHN CHAPMAN—*Diarrhœa and Cholera*, 2d Ed., London, 1866, p. 29. The list might be extended to almost any length, but it would answer no useful purpose to do so.

¶ Some of these have already been alluded to in note ‡, p. 739, *supra*, and in note ‡, p. 811, *supra*. I will only make mention, in addition, of a few which are still praised in the posthumous works of ETTMÜLLER—T. I, Cap. 9, p. 127, *op. cit.*, p. 647, *supra:* "*Priapi:* Priapus cervi, tauri et ceti, quos inter ipsos priapus ceti est omnium optimus, post hunc est priapus cervi, vilissimus est priapus tauri." These may be smoked dry and powdered, and as much as an ounce given at a dose, alone or mixed with other medicines; or a decoction may be prepared from them. He gives in detail a number of formulæ, and cites authorities in proof of the excellent effects produced. Although burnt bones and horns are no doubt useful, yet above all the *human cranium*, properly pulverized, is a remarkable specific in dysentery, especially if it be taken from a man who has perished by a violent death. Moreover, the *lichen* that grows on the human cranium exposed to the weather, *usnea humani cranii*, (lichen plicatus,) has often been demonstrated to possess curative virtues; that is best which forms on the skull of a man who has been hanged or broken on the wheel. He praises, besides, the tooth of a hippopotamus; the blood of a hare hunted to death; the livers of snakes, vipers and frogs, especially in malignant dysenteries; stercus canis in goats' milk with sugar; horses' hoofs toasted, &c. Compare the Amsterdam edition of his Opera, Vol. II, 1697, p. 156 *et seq.*

MEDICATION BY THE RECTUM.—The history of enemata goes back at least to the time of the ancient Egyptians, who, as Herodotus testifies, had a custom of using emetics and clysters three days in every month for the purpose of preserving their health.* The Greek physicians made great use of clysters in the treatment of the fluxes, particularly in dysentery and the cœliac flux, preferring this method to medication by the mouth whenever they supposed the morbid process to be seated chiefly in the large intestine.† Sometimes they injected whey, milk, ptisan, broth of spelt and the like, intending thus to wash out acrid humors from the bowel and favor the efforts of nature to evacuate them; sometimes they aimed to sheath the intestinal mucous membrane, and protect it against acrid humors descending from above, by injecting oleaginous and gummy substances; or they endeavored

* HERODOTUS—*Euterpe*, Cap. 77: "Of the Egyptians, those who inhabit that part of Egypt which is sown with corn, in that they cultivate the memory of past events more than any other men, are the best ieformed of all with whom I have had intercourse. Their manner of life is this. They purge themselves every month, three days successively, seeking to preserve health by emetics and clysters; for they suppose that all diseases to which men are subject proceed from the food they use."—Cary's transl., Amer. Ed., New York, 1855, p. 124.

† See note †, p. 362, *supra*. A word may be said here with regard to the instruments originally employed for the purpose of administering clysters. A bladder with a pipe tied in its orifice was the simple means first used. This was no doubt the method employed by the Egyptians, as it was long afterwards by the Greeks, Arabians and modern Europeans. The apparatus recommended in the Hippocratic treatise *De his quæ uterum non gerunt*, [Ed. Littré, VIII, 431,] for vaginal injections differed from this only in having a number of little orifices in the sides of the pipe. The apparatus described by AVICENNA—Lib. III, Fen 16, Tract. 4, Cap. 11, p. 843, *op. cit.*, p. 632, *supra*—which was devised to provide for the escape of flatus simultaneously with the introduction of the clyster, was more complicated, but the propulsive power was still exerted by means of a bladder. And the same is true of the two forms of apparatus figured by FAB. HILDANUS—Cap. X, p. 690, *op. cit.*, p. 644, *supra*. One of these is a beef bladder with a short wide tube tied in its orifice; this tube is provided with a stop-cock, and serves to fill the bladder for use, after which the pipe fits in with a slip-joint. This appears to have been the form then commonly in use. The other is claimed by HILDANUS as his own invention, and could be used for self-injection as well as to administer clysters to others. In it the bladder has tied into it at one extremity the same fittings as the first apparatus; at the other extremity a long thick tube is tied in, which is provided with a stop-cock at the end next the bladder, while near the other end the slender tube for insertion into the anus projects at right angles. The first metallic syringe for this purpose is figured in the work of MARCUS GATINARIA—*De curis ægritudinum particularium*, Lyons, 1525, fol. 44. From the figure, it appears to have been a straight cylinder, from one end of which the anal pipe projected, while a solid cylinder of metal inserted at the other end served as a piston. Attached to the anal pipe and parallel with it is a second smaller pipe intended for the escape of flatus. The figure in the edition of 1532 is shaded somewhat differently, but represents essentially the same thing; that in the edition of 1560 is a fac-simile of the one in the edition of 1525; and that in the Frankfort edition of 1604 is copied on a rather larger scale from the edition of 1532. See Fig. B. GATINARIA ascribes this clyster apparatus to AVICENNA. MALGAIGNE—*Œuvres d'Ambroise Paré*, T. 1, Paris, 1840, Introduction, p. xcix—regards the Italian as the genuine inventor of the modern syringe: "Gatenaria décrit la seringue sous le nom d'instrument à clystères, et il juge même nécessaire d'en donner la figure; mais, comme la plupart des inventeurs de cette époque, il n'ose pas de sa propre autorité introduire une si grande innovation dans la pratique; il se réfugie derrière Avicenne, qui en a donné la description, dit-il, mais qui a été mal compris par plusieurs. Cette déclaration du modeste auteur nous oblige cependant de déclarer qu'il n'y a absolument rien de semblable dans Avicenne." On the other hand, E. COLSON—*De la méthode intestinale*, Paris Thesis, No. 113, 1867, p. 15—insists that GATINARIA did no more than copy AVICENNA, as he himself says he did. BROCHIN—Art. *Lavement*, Dict. Encyclopédique des Sci. Méd., 2me Série, T. II, Paris, 1869, p. 85—however, advocates the view of MALGAIGNE, remarking that it is sufficient to compare the two descriptions to be satisfied that there is only a very distant resemblance between the two instruments. I confess that, with nothing but the two descriptions before me, I should believe that GATINARIA had simply copied the Arabian physician, and that both had used a double-barrelled pipe, with the larger barrel attached to a simple bladder or bag, the fluid being injected through this larger barrel while the smaller was intended to serve for the escape of flatus. The figures in the work of GATINARIA, however, suggest more than his description. I append the two descriptions for the judgment of the learned reader. AVICENNA—*loc. cit.*, *supra*—writes: "Melior quidem cannæ clysteris figura, quam antiqui dixerunt, est ut sit circulatio cannæ ejus divisa per tertiam et duas tertias, et sit positum inter utranque velamen de corpore, de quo facta est canna, et sit consolidatum cum canna consolidatione vehementi, sit ergo velamen ejus duarum partium diversarum. Et sit uter decenter aptatus in parte, quæ duarum partium major est, et sit in parte minore apertus. Et quando uter decenter aptatus est super totam cannam, stringatur caput partis minoris cum consolidatione forti, ut non ingrediatur ipsam aer, et sit ei sub utre in loco, qui non ingreditur anum, meatus, per quem egrediatur ventositas. Quum enim administratur clystere, et expriceitur cum fortitudine ventositas, egreditur enema, et sistitur enema bene, ventositas. Enim est, per quam redit ad exitum et facit necessitatem surgendi ad sellam cum velocitate." GATINARIA—*loc. cit.*, *supra*: "Hæc est forma clisteris quam non intelligunt multi: et quam describit Avicenna scilicet quod pars superior scilicet canna ejus sit dupla ad partem inferiorem et medict inter has partes medium unum sient paries dividens partes illas sicut est in duabus fistulis conjunctis: et habeat pars minor unum foramen in parte quæ est prope conjunctionem bursæ clisteris: et aliud in opposito directe secundum longitudinem quod sit apud foramen partis grossioris: per quam partem majorem cui contiguatur maxime bursa transeat aquositas enematis imposita per utrem: per inferiorem vero cannam sive minorem pulsa ab enemate ventositate per utris compressionem ipsa ventositas egrediatur: et hoc patet in figura et reddent dicta cum causa literam Avicennæ obscuram claram." The observation of HELIDÆUS of PADUA, that dysentery may be communicated to healthy individuals by means of the clyster-pipe, has already been referred to—p. 647, *supra*. On the other hand, BANKIER—p. 53, *op. cit.*, p. 637, *supra*—relates, on the authority of Dr. BARRY, that "in the years 1797, 1799, the dysentery prevailed in the Caithness legion of Fencibles to some extent. The Surgeon, anxious to determine the question as to its infectious nature, caused the same clyster pipe to be used, without cleansing, for those labouring under dysentery, and those who were free from the disease,—the latter notwithstanding were not infected." This filthy experiment is not very conclusive, in the absence of information as to the character of the epidemic, and I incline strongly to the prudent advice of HEURNE—S. 542, *op. cit.*, p. 529, *supra*—that, if possible, each patient should have his own bedpan or night stool, enema-syringe, &c. Certainly where the same syringe has to be used for different individuals it should be thoroughly cleansed and disinfected each time it is used.

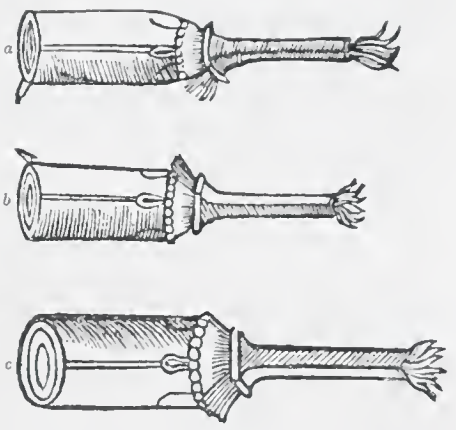


FIG. B.—Fac-similes of the cuts representing the enema apparatus of GATINARIA. *a*, In the edition of 1525; *b*, in the edition of 1532; *c*, in the edition of 1604.

to check the flux by injecting astringent decoctions of various kinds, and to allay pain by clysters containing opium, hyoscyamus and other narcotics; finally, in ulcerative dysentery and in the cœliac flux, they essayed to stimulate the intestinal ulcers to cicatrization by enemata containing various styptic and escharotic mineral substances, such as alum, the scales and oxide of copper, quicklime and the native sulphurets of arsenic.* These more potent substances appear to have been avoided by Celsus,† but the Arabians adhered in this respect to the Greek practice,‡ which survived the middle ages and still found defenders as late as the sixteenth century.§

About this time, however, a prudent opposition to the employment of enemata containing caustic or corrosive substances began to make itself felt. Rondeletius held that the practice of the ancients in this respect should not be imitated, for orpiment, quicklime and the like must act as caustics to the intervening surface of the intestines as well as to the ulcers. His views were shared by Felix Plater, Forestus, Hildanus, Septalius and Sennertus.‖ Hildanus pointed out that gangrene is produced by the external application of arsenic, and indignantly asked what else was to be expected if it be applied to so delicate a surface as that of the intestines. These physicians used in dysentery demulcent clysters of barley water, syrup of roses, yolks of eggs and other bland substances, to which, while the pain was acute, they added opium or other anodynes, and in the advanced stages relied on decoctions and infusions of the vegetable astringents, to which they sometimes added burnt hartshorn, Armenian bole and other drying remedies, or mastic, frankincense and other resinous drugs, believed to be possessed of healing virtues.

Zacutus Lusitanus¶ vainly attempted to combat the new views, declaring that it was better to inject even quicklime and arsenic than to let the patient die. His protest failed to check the general movement in the direction of reform; indeed, objections began to be heard even against the more innocent enemata which still continued in use. That wild

* The following are references to some of the most important passages in Greek medical writers referring to the use of clysters in the fluxes: In the Hippocratic treatise *De morbis mulierum*, Lib. I, § 109, [Ed. Littré, VIII, 233,] will be found a formula for a clyster to be used in dysentery, consisting of the dried rind of pomegranate boiled in wine with the addition of honey and oil; also, for tenesmus, an injection containing incense and rose oil with barley water and boiled sea water; and another composed of an infusion of hellebore with oil. The use of enemata of boiled milk in dysentery is commended in the treatise *De affectionibus*, *loc. cit.*, note *, p. 689, *supra*. Among the enemata commended by GALEN I may mention *whey*, either unmodified or that in which heated stones or iron has been quenched to give it astringency—*De simp. med. temp. ac fac.*, Lib. X, Cap. 2, [Ed. Kühn, XII, 266;] *hydromel* and *cream of ptisan*—*Comm. VI in Hippoc. Epidem.*, VI, § 5, [Ed. Kühn, XVII, B, 329;] *broth of tragus, goats' suet* and *rose cerate*—*Comm. II in Hippoc. Epidem.*, II, § 17, [same Vol., A, 352,] and *Meth. med.*, Lib. XII, Cap. 1, [Ed. Kühn, X, 813,] I suppose this tragus to be the spelt, described in *De aliment. fac.*, Lib. I, Cap. 13, [Ed. Kühn, VI, 519;] decoctions of various *astringent herbs* and *fruits*, such as the pomegranate, quince, &c.—*De remed. parab.*, Lib. I, Cap. 13, [Ed. Kühn, XIV, 380;] clysters of *brine* are useful for cleansing the dysenteric ulcers, if they become putrid—*Comm. I in Hippoc. de Humor.*, § 12, [Ed. Kühn, XVI, 146.] A considerable number of formulæ for clysters recommended in dysentery and the cœliac flux will be found in the treatise *De comp. med. secundum locos*, Lib. IX, Cap. 5, [Ed. Kühn, XIII, 295 *et seq.*] Some of these are lauded as anodyaes, (sedans dolorem,) and contain *opium* and *hyoscyamus* variously combined with other remedies, chiefly aromatic and astringent, while others contain the styptics and escharotics referred to in the text, such as *alumen*, *squamæ æris*, *æs ustum*, *calx viva*, *sulfur virum*, *cadmia*, *sandaracha* (red sulphuret of arsenic) and *auripigmentum*, (yellow sulphuret of arsenic,) to which *galls*, *gum tragacanth* or *gum acacia*, *oplum*, *hyoscyamus*, &c., were frequently added. The following is a sample of these formulæ: "*Infusum aliud ut Idius.* ℞. Aeris usti ʒxxiv, calcis vivæ, aluminis scissi, utriusque tantundem, chartæ ustæ ʒxxx, auripigmenti drach. xij, sandarachæ drach. xij, excipe vino myrteo aut rosarum decocto, quæ cum vino austero ad dimidias coctæ sint et expressæ, atque ita lævigatas forma in pastillos, eosque infunde cum aqua."—*Ib.*, p. 297. Recipes for injections of the same character as those preserved by GALEN will be found in the works of ORIBASIUS—*Collect. Med.*, Lib. VIII, Cap. 25, T. II, p. 225, Ed. cited p. 683, *supra*; ÆTIUS—Tetrab. III, Serm. I, Cap. 45 and 49, pp. 605 and 612, Ed. cited p. 656, *supra*; and ALEXANDER of TRALLES—Lib. VIII, Cap. 8 and 9, pp. 451 and 461, Ed. cited p. 624, *supra*.

† CELSUS—Lib. IV, Cap. 15, Vol. I, p. 296, Ed. cited p. 656, *supra*—directs in chronic dysentery injections of cream of ptisan, milk, melted fat or deers' marrow, oil or butter with rose oil, raw whites of eggs with the same, decoction of linseed, and yolks of eggs with decoction of rose leaves. He adds that THEMISON recommended strong brine for the same purpose, and that a piece of minium triturated with salt, then mixed with water and injected, has a powerful influence on intestinal ulcers—see notes * and †, p. 763, *supra*.

‡ See RHAZES—*Ad Mansor. de re med.*, Lib. IX, Cap. 72, p. 259, Ed. cited p. 678, *supra*, and *Ad Mansor. antidotis*, Lib. I, Cap. 40, p. 475, same Vol.; also AVICENNA—Lib. III, Fen 16, Tract. 2, Cap. 7, T. I, p. 823, Ed. cited p. 632, *supra*, and Lib. V, Summa 2, Tract. 6, T. II, p. 330.

§ See, for example, HOLLERIUS—*De morb. intern.*, Lib. I, Cap. 40, fol. 120, Ed. cited p. 680, *supra*; and ZACUTUS LUSITANUS—*loc. cit.*, note ¶, *infra*.

‖ RONDELETIUS—*Meth. cur. morb.*, Lib. III, Cap. 21, p. 462, Ed. cited p. 680, *supra*; FORESTUS—Lib. XXII, Obs. 34, Scholium, p. 381, Ed. cited same page; HILDANUS—Cap. X, p. 689, *op. cit.*, p. 644, *supra*; FELIX PLATER—T. III, p. 811, *op. cit.*, p. 680, *supra*; SEPTALIUS—Lib. VII, § 102–3, p. 229, *op. cit.*, same page; SENNERTUS—T. III, p. 174 *op. cit.*, p. 645, *supra*. I note *urine* among the clysters commended by HILDANUS.

¶ ZACUTUS LUSITANUS—*De Med. Princip. Hist.*, Lib. II, Hist. 86, Paraphrasis, Vol. I, p. 332, *op. cit.*, p. 665, *supra*. I note, too, that SENNERTUS—p. 182, Vol. cited last note—while condemning the injection of these caustic substances in a general way, admitted that there might be desperate cases in which they were required.

enthusiast Van Helmont directed one of his wildest diatribes against this mode of treatment.* and although his followers were by no means numerous, yet even among other physicians clysters now began to be less indiscriminately employed. Ettmüller declared that by their abuse injurious effects were often produced; Hoffmann counselled caution even in the use of milk, gum, gelatine and the like, insisting that, instead of benefiting the patient, they often made the disease worse;† Van Swieten held that the quantity of fluid injected ought never to exceed three or four ounces;‡ while Degner went still further, and boldly affirmed that clysters were unsuited to the treatment of dysentery.§

It is true that this extreme view did not long maintain its ground; nevertheless, during the last century and the beginning of the present, physicians were for the most part cautious in the use of clysters for this disease. Zimmermann countenanced only the sparing use of infusions of chamomile or other bitter herbs and flowers, and expressed the opinion that clysters containing laxative, emollient and fatty substances are injurious.‖ Fournier and Vaidy admitted that emollient clysters are indicated in dysentery, yet thought that, unless great dexterity was employed in administering them, the irritation produced by the introduction of the clyster-pipe counterbalanced any advantages that might be expected.¶ Even during the last century, however, anodyne injections enjoyed a certain degree of popularity, and since the commencement of the present century there has been a general revival of medication by the rectum in dysentery.

*Anodyne clysters.*—Enemata containing some preparation of opium were, as has already been shown, very commonly employed in ancient medicine, and *suppositories* containing opium, with or without astringents, were frequently employed by both the Greek and Arabian physicians for the same purpose.** Gordonius declared, near the close of the thirteenth century, that such suppositories are a great remedy in dysentery,†† and his practice has

* VAN HELMONT—*Pleura furens*, § 28, p. 395, *op. cit.*, p. 488, *supra*. He argued that it must be fruitless to administer clysters in dysentery, which be held to affect only the small intestines, whereas the clysters reach only the large. It is therefore better to use some rational remedy, such as the dried and powdered penis of the stag or the bull; or, still more to be praised, the dried blood of a goat—not common blood, but blood obtained for this particular purpose from a he-goat, hanged by his horns to which his hind legs must be tied, by castrating him and allowing him to bleed to death from the wound—§ 32, p. 396. There was a noble gentleman who had been vainly treated by the court physician with more than 426 clysters, and yet after he had had 1,800 stools and more he cured him with medicaments given by the mouth alone. Do any of these Galenists imagine that they can cure intestinal ulcers by clysters? Let them remember, I beg of them, that, although the intestinal mucous membrane is insensible to the fæces, for which it is intended by nature, the clysters are foreign substances that can only excite pain and do harm. This error flows from the error of the schools in defining dysentery as ulceration of the intestines. Certainly I see that a bloody Moloch presides in the chairs of medicine. Repent, my professional brethren, for the world will one day shudder with dire horror at the sound of the trumpet when every one shall give an account of his stewardship.

† ETTMÜLLER—*loc. cit.*, note ¶, p. 824, *supra:* "Clysteres alias noti et frequentissimi sunt in dysenteria, sed sæpius pessimi: scilicet nimio abusu malum exasperant potius quam leniunt. Usus laudem habet, vituperium meretur abusus." In the explanations that follow, as in other parts of the same chapter, he avowedly follows VAN HELMONT, and yet he praises the rules laid down by SEPTALIUS, ("citato loco qui est elegans," referring to the passage from which I have cited, note ‖, last page,) who, though he objected to abstergent and caustic clysters, favored the moderate use of anodyne and emollient ones in suitable cases. HOFFMANN—T. III, p. 158, *op. cit.*, p. 681, *supra, Cautelæ, et monita practica, Sect. VI:* "Quamvis vero haud in totum improbari queant hæc remedia; monendos tamen esse duco medicos, ut in illis adhibendis cauti procedant, modumque servent. Nam fluida hæc glutinosa per anum admissa faciunt lentorem, ulcera magis fœdant, et cicatrici resistunt; efficiuntque sæpius, ut compresso alvi profluvio, ventris colluvies magis cumuletur, et fermentando graviores spasmos induceat ac tormina." Yet, after the noxious material was voided and the intestinal spasms quieted, he authorized the use of clysters of goat or deer suet, yolk of egg, turpentine or balsams.

‡ VAN SWIETEN—T. II, p. 391, *op. cit.*, p. 663, *supra*—writing of purgative enemata, which he regards as a useful aid to purgative medicines in getting rid of the irritating acrimony, says: "Ubi vero ad hunc usum clysmata adhibentur, requiritur, ut in adultis trium quatuorve unciarum quantitatem non excedant; sicque et proportionaliter in junioribus, ne nempe mole sua irritent intestina, sicque subito iterum per alvum exeant." He commends honey and water for this purpose in the quantity named, and, as will be mentioned further on, also approved of anodyne enemata.

§ DEGNER—Cap. V, § 31, p. 311, *op. cit.*, p. 625, *supra:* "Clysteribus dysenteriam curare, ejusque fluxum sistere velle, absonum mihi videtur, etenim illi non solummodo fontem mali non semper attingunt, sed etiam improvidus, aut nimis sæpe iteratus eorum usus majus incommodum inducit." In support of this view he gravely cites in a foot note the case related by VAN HELMONT—see note *, *supra*—in which 426 clysters were vainly given!

‖ ZIMMERMANN—Cap. X, S. 468, *op. cit.*, p. 648, *supra*. He holds besides that many clysters should not be administered, and that they should never exceed seven or eight ounces.

¶ FOURNIER et VAIDY—p. 385, *op. cit.*, p. 362, *supra*. They remark also: "Nous avons été obligés souvent d'y renoncer dans les hôpitaux militaires, où le soin d'administrer les lavemens est confié trop ordinairement à des infirmiers maladroits et ivrognes." A sad picture of the discipline of the military hospitals of that day! Let us hope our own are better managed.

** For formulæ for such suppositories (Greek, *βάλανος* or *ὑποθετόν*, Latin, glans) see, for example, ALEXANDER of TRALLES—Lib. VIII, Cap. 9, pp. 461-2, Ed. cited p. 624, *supra;* AËTIUS—Tetrab. III, Serm. I, Cap. 49, p. 616, Ed. cited p. 656, *supra;* and RHAZES—*Ad Mansor. de re med.*, Lib. IX, Cap. 72, p. 269, Ed. cited p. 678, *supra*.

†† GORDONIUS—fol. 162, *op. cit.*, p. 680, *supra:* "Si autem non possit dormire fiat suppositorium quod inducit somnum et constringit, et hoc est magnum remedium."

since found many imitators, although the majority of practitioners have preferred to inject the narcotic in a fluid form.* Enemata of this character were countenanced in most of the works on dysentery published in the sixteenth and seventeenth centuries, and continued to be employed after the use of almost all other clysters had fallen into discredit.†

Sydenham commonly administered clysters of milk and theriaca, regarding them as possessed of wonderful efficacy in checking the motions.‡ Van Swieten held this combination in equal esteem, although he preferred to use more theriaca and less milk.§ Pringle used emollient clysters, to which he added from twenty to fifty drops of laudanum, and thought this probably the best mode of giving opiates, though he admitted that he was often compelled to desist from using them on account of the local tenderness. Donald Monro declared that opiate clysters often gave more relief than anodynes administered in any other way.‖ Since then such injections have been commended by Blane, Hunter, Ballingall, Bampfield, Cheyne, Abercrombie, Annesley, Twining, Bankier, Hauff, Baly, Austin Flint, Bamberger, Morehead, G. B. Wood, Aitken, Savignac, Barrallier, Heubner and many other physicians.¶ Starch water or other mucilaginous fluids combined with laudanum have been the usual prescription, but other preparations of opium, as well as the extracts of hyoscyamus and other anodynes, have been employed. Several of the writers named favor also the use of opium suppositories as equal or even in some cases superior in their operation to the enemata. The notion has been generally entertained that the local symptoms, and especially the painful tenesmus, can be more efficiently controlled by these local applications than by the internal administration of the same drugs.

Nevertheless certain disadvantages, which have been conceded even by their advocates, attend the use of these enemata. Not infrequently the condition of the anus is such that even the most careful introduction of the clyster-pipe provokes serious irritation, and although the quantity of fluid injected be restricted as much as possible, its presence in the rectum often provokes a reflex action by which it is promptly expelled, so that the effect of the operation is to increase rather than to diminish the local irritation. Moreover, even when it is retained longer, the enema is so frequently expelled before the anodyne dissolved in it can be wholly absorbed that the physician must always feel a degree of uncertainty, as to just how much of the drug selected he is introducing into the circulation, which cannot fail to embarrass him in his management of the case.

These considerations have led many physicians, among them such skilful practitioners as Vogt and Niemeyer, to regard the use of these, and indeed of all other clysters, with

* Note how cautiously SENNERTUS—T. III, p. 176, *op. cit.*, p. 645, *supra*—speaks of the use of the suppositories commended by RHAZES.

† See, for example, the remarks on the use of narcotic clysters by ALTOMARUS—Cap. 74, fol. 184, *op. cit.*, p. 680, *supra;* and NICOLAUS PISO—Lib. III, Cap. 15, p. 277, *op. cit.*, p. 665, *supra*—both of whom professed the opinion of AVICENNA—see p. 736, *supra*—that narcotics can be given more safely by the rectum than by the mouth. See also HILDANUS—*loc. cit.*, note ‖, p. 826, *supra*, and SENNERTUS—*loc. cit.*, last note.

‡ SYDENHAM—*Med. Obs.*, Sect. IV, Chap. 3, Vol. I, p. 172, *op. cit.*, p. 407, *supra:* "Besides which, I give a clyster of half a pint of cow's milk, and half an ounce of Venice treacle, [*i. e.*, theriaca, see p. 730, *supra.*] This is thrown up every day, and is of wonderful efficacy in checking the motions."

§ VAN SWIETEN—§ 722, T. II, p. 394, *op. cit.*, p. 663, *supra*—taught that opium, or the compositions of the shops which contain it, if dissolved in milk and used as a clyster, check almost all alvine fluxes, (quasvis fere alvi dejectiones sistunt.) He particularly commends an ounce of theriaca in three or four ounces of milk.

‖ PRINGLE—p. 271 *et seq.*, *op. cit.*, p. 640, *supra:* "Although the advantage of clysters was manifest, yet we could not avail ourselves of them in the hospital so much as we wished; partly from the neglect of the nurses, and partly from the reluctance of the men to use them: even in private practice, we are frequently obliged to desist from them, on account of the tenderness of the parts." DONALD MONRO—p. 78, *op. cit.*, p. 625, *supra.*

¶ Sir GILBERT BLANE—p. 465, *op. cit.*, p. 637, *supra;* HUNTER—p. 236, *op. cit.*, p. 637, *supra;* BALLINGALL—p. 78, *op. cit.*, p. 682, *supra;* BAMPFIELD—p. 156, *op. cit.*, p. 682, *supra;* CHEYNE—p. 50, *op. cit.*, p. 686, *supra;* ABERCROMBIE—p. 280, *op. cit.*, p. 553, *supra*—strongly commended injections of lime-water and milk with the addition of an opiate; ANNESLEY—Vol. II, p. 279, *op. cit.*, p. 621, *supra*—commends, besides enemata containing opium, the use of the extract of hyoscyamus, or extract of conium in the same way; TWINING—Vol. I, p. 72, *op. cit.*, p. 608, *supra;* BANKIER—p. 169, *op. cit.*, p. 637, *supra;* HAUFF—p. 425, *op. cit.*, p. 534, *supra;* BALY—p. 536, *op. cit.*, p. 535, *supra;* AUSTIN FLINT—p. 213, *op. cit.*, note §, p. 710, *supra;* BAMBERGER—S. 411, *op. cit.*, p. 578, *supra;* MOREHEAD—p. 309, *op. cit.*, p. 657, *supra;* G. B. WOOD—Vol. I, p. 724, *op. cit.*, p. 671, *supra;* AITKEN—Vol. II, p. 639, *op. cit.*, p. 647, *supra;* SAVIGNAC—p. 425, *op. cit.*, p. 620, *supra;* BARRALLIER—p. 782, *op. cit.*, p. 603, *supra;* and HEUBNER—S. 546, *op. cit.*, p. 529, *supra.* The last mentioned author, however, appears to give the preference to anodyne suppositories.

distrust, or to reject them altogether.* Tripler testified that in his experience anodyne enemata were apt to become of themselves sources of irritation and to aggravate the sufferings of the patients,† and Stillé entertained serious doubts whether enemata are ever useful in the acute stage of dysentery.‡ These objections, combined with the obstacles to this mode of medication usually encountered in the military service, served to limit the employment of anodyne enemata during our civil war. They are mentioned with favor by a few of the reporters;§ but the testimony presented is not sufficient to throw much light on the question of their real utility. For myself, while I do not doubt in the least that they are very often of apparent, and sometimes of real benefit, I think it probable that all the good they are capable of doing can be obtained with greater certainty by the hypodermic injection of morphia, and anticipate that with the extension of the latter mode of medication they will disappear from practice.

The introduction into the rectum of *carbonic acid gas* and of *vapor of chloroform* have been suggested with a view to the production of a local anæsthetic effect, but the evidence that beneficial effects can really be produced in this way is far from conclusive.‖ Quite recently, also, injections of the *hydrate of chloral* have been brought into use, but it would be premature as yet to express an opinion as to their value.¶

*Astringent and drying clysters.*—Infusions and decoctions of the various *vegetable astringents* continue to be occasionally employed as enemata in the later stages of acute dysentery and in the chronic fluxes. They were regarded with favor by Annesley, Bamberger, Savignac, Barrallier, Heubner and others,** and are usually administered in combination with some preparation of opium, but have not, during the present century, enjoyed the popularity of some of the substances of the group next to be mentioned. Among the *mineral astringents* that have been used as clysters, alum, the astringent salts of iron, the acetate and subacetate of lead, the sulphates of zinc and copper and the nitrate of silver may be particularly mentioned; each has had its advocates,†† but the salt last named has enjoyed by far the greatest popularity.

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* VOGT—S. 188 *et seq.*, *op. cit.*, p. 645, *supra*. NIEMEYER—Bd. II, S. 756, *op. cit.*, p. 645, *supra*.

† TRIPLER—p. 33 *et seq.*, *op. cit.*, p. 691, *supra:* "In the more purely dysenteric cases, when the rectum is the chief seat of local difficulty, anodyne injections have long been favorite remedies. I cannot say that I have seen any decided benefit from them. They do seem to allay tenesmus for a while, and thus procure some little rest to the patient; but from their frequent repetition, they become themselves sources of irritation, aggravate the sufferings of the patients, and are, of necessity, abandoned."

‡ STILLÉ—p. 366, *op. cit.*, p. 650, *supra*—speaking of acute dysentery in patients who are "not of a vigorous constitution," says: "Enemata are useful in this form of dysentery, if in any acute form, of which there is serious doubt."

§ See, in Section II, the reports of STORROW—p. 43, *supra;* SCHÜSSLER—p. 44; PENROSE—p. 45; COUES—p. 61; JONES—p. 85; and GAGE—p. 93. I myself—p. 230, *op. cit.*, p. 606, *supra*—in 1863, regarded the employment of laudanum enemata in acute dysentery with favor; but I had not yet, at that time, become practically acquainted with the hypodermic method.

‖ Seltzer-water injections have been occasionally employed on account of the *carbonic acid gas* they contain. They have quite recently been praised by CONSTANTIN PAUL—*loc. cit.*, note ', p. 773, *supra*—as a means of relieving tenesmus. MOREHEAD—vide *infra*—after suggesting the introduction of chloroform vapor through a enontchone tube, remarks: "If it be a therapeutic fact as stated by Dr. Simpson, that carbonic acid is anæsthetic and curative of foul ulcers, then applied by the same simple means it may be worthy of trial in chronic dysentery." I am not aware that this hint has been acted upon. The employment of *vapor of chloroform* for the relief of tenesmus was suggested by EHRENREICH—*Chloroform-Dunst-Klystiere gegen Tenesmus bei der Ruhr*, Med. Zeit., Jahrg. XXII, 1853, S. 138—who introduced 30 drops of chloroform into a common syringe, allowed it to vaporize and injected the vapor, with great relief to the patient; he suggested that as much as a drachm might be used in this way. MOREHEAD—p. 398, *op. cit.*, p. 657, *supra*—remarks: "The vapour of chloroform introduced into the rectum, is probably deserving of a more extensive trial than it has yet had in the circumstances for which opiate enemata are usually employed. It might be conveniently applied by means of the simple caoutchouc cylinder and tube, used by Dr. Simpson, for conveying the vapour to the os uteri."

¶ Enemata of *hydrate of chloral* have been employed with apparent benefit by NEWELL, WHITAKER, TYSON and others—see p. 760, *supra*.

** ANNESLEY—Vol. II, p. 298, *op. cit.*, p. 621, *supra*—mentions particularly *tincture of catechu* as an addition to enemata composed of the infusion of cinchona, or of calumba, &c. BAMBERGER—S. 412, *op. cit.*, p. 578, *supra*—specifies particularly tannin, with or without opium; the other vegetable astringents he regards as less efficacious. SAVIGNAC—p. 428, *op. cit.*, p. 620, *supra*—commends, besides tannin, catechu, rhatany, oak-bark and other vegetable astringents. Oak-bark is the one he employs most frequently and with the greatest advantages. BARRALLIER—p. 783, *op. cit.*, p. 603, *supra*—does not mention tannin, but praises the other substances named by SAVIGNAC; and HEUBNER—S. 546, *op. cit.*, p. 529, *supra*—specifies rhatany and tannin.

†† A solution of *alum* and white vitriol was one of the enemata recommended by ROBERT JACKSON—p. 458, *op. cit.*, p. 770, *supra*—in chronic ulcerative dysentery. PARKES—p. 154, *op. cit.*, p. 682, *supra*—speaking of adynamic dysentery, wrote: "Injections of alum are very useful in that variety where the intestine is so disorganized as to tear like wet paper after death." D. DONOVAN—*Obs. on the diseases to which the famine of 1847 gave origin*, &c., Dublin Medical Press, Vol. XIX, 1848, p. 278—preferred injections containing alum and laudanum to those containing acetate of lead or nitrate of silver. HAMON—*De la dysenterie et de son traitement par le sulfate d'alumine et de potasse, en lavements*, L'Union Méd., T. XI, 1857, p. 247—elevated

The use of injections of the *nitrate of silver* in dysentery was suggested in 1817 by Robert Jackson, who, however, did not actually employ them. A weak solution was used, without decided results, by Cheyne in the Dublin dysentery of 1818, and Hudson testifies that he saw enemata containing this salt successfully administered to dysenterics by Osborne in 1831.* But it was undoubtedly the prominence given to such enemata by Boudin (1836) in connection with typhoid fever that led to their subsequent extensive trial in both acute dysentery and the chronic fluxes. Among those who have warmly advocated them I may mention Trousseau, Masselot and Follet, Garlike, Weatherby, Palmer, Bamberger, Fouquet, Duclos, Gros, Savignac, Caradec and Gestin.† During our civil war these injections were employed by several of the military surgeons, and an account of fifteen cases of camp diarrhœa thus treated under the direction of Assistant Surgeon A. Hartsuff, U. S. A., at the Judiciary Square hospital, Washington, D. C., during the summer of 1863, has been presented in a previous portion of this chapter.‡

When these clysters are to be administered the crystallized nitrate of silver is usually selected, dissolved in distilled water and injected with a glass syringe. The quantity of fluid used is generally small; in most cases two to six ounces. The strength of the solution most frequently employed is from half a grain to two grains to the ounce; but some physicians prefer stronger solutions, and as much as ten or fifteen grains to the ounce, or even more, have been injected with alleged advantage. Savignac has given the preference to a solution of nitrate of silver and chloride of sodium in albuminized water; his method

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alum clysters to the principal position in the treatment of dysentery. In two epidemics (1854-5) in the department of the Sarthe, he relied exclusively on injections containing 4 to 8 grammes of alum; of 75 patients, two, old men, only died. See also VALÉRIUS—*Lavement aluné*, Bull. Gén. de Thér., T. LVIII, 1860, p. 168. PIEDVACHE—*Mémoire sur la dyssenterie épidémique et sur son traitement*, Gaz. Méd., T. XIV, 1859, p. 272—used it to some extent, and SAVIGNAC—p. 434, *op. cit.*, p. 620, *supra*—approved it, though he pointed out that, if the solution is too strong, it is prone to irritate, and advised, therefore, that it should not exceed 4 grammes to the quart of liquid. Injections of *perchloride of iron* have been commended by BAUDON—*loc. cit.*, note *, p. 773, *supra*, and PAUL—*loc. cit.*, same note; of *Monsel's salt* by L. MCGUIRE—*Chronic dysentery successfully treated with the subsalphate of iron*, Pacific Med. and Surg. Jour., Vol. III, 1869-70, p. 511. A solution of *acetate of lead* has been recommended for the same purpose by BALLINGALL—p. 78, *op. cit.*, p. 682, *supra*; CHEYNE—p. 51, *op. cit.*, p. 686, *supra*; and PARKES—p. 146, *op. cit.*—who writes: "Injections of the acetate of lead in large doses, such as one drachm every four hours, (!) are sometimes very useful. Injections of the *subacetate of lead* are praised by D. GUÉRAUD—*Du sous-acétate de plomb en injections intestinales dans la diarrhée et la dysenterie*, Paris Thesis, No. 58, 1855—who relates that BARTHEZ employed them with success in the dysentery prevailing among the troops of the garrison of St. Denis during the year 1844: they were also used by PIEDVACHE—*loc. cit.*, *supra*. SAVIGNAC—p. 433, *op. cit.*, p. 620, *supra*—held that injections of the subacetate are preferable to those of the acetate, but he advises care in their use lest the accidents of lead poisoning should supervene, and adds: "C'est une arme à tenir en réserve pour ne s'en servir qu' en cas de nécessité, lorsque l'on n'a pu retirer aucun profit des autres topiques modificateurs." I may add that injections containing *carbonate of lead* have been recommended by DEVERGIE—*Emploi de l'acétate de plomb décomposé par le carbonate de soude, pour arrêter la diarrhée des phthisiques*. Bull. Gén. de Thér., T. XI, 1836, p. 146—who advises every morning and evening an injection containing two grains of acetate of lead and one of carbonate of soda with four drops of Sydenham's laudanum dissolved in a decoction of linseed. Injections containing *sulphate of zinc* have been recommended by BALLINGALL—*loc. cit.*, *supra*—and by JACKSON—*loc. cit.*, *supra*—who also commends *sulphate of copper* for the same purpose. BAMBERGER—*loc. cit.*, last note—mentions with approval alum, acetate of lead, sulphate of zinc, sulphate of copper, sulphate of iron and nitrate of silver, giving the preference to the latter. G. B. WOOD—*loc. cit.*, note ¶, p. 828, *supra*—approves acetate of lead, sulphate of zinc and nitrate of silver; HEUBNER—*loc. cit.*, last note—sulphate of zinc, acetate of lead, alum and nitrate of silver, yet admits that too much should not be expected of them. SAVIGNAC—p. 435, *op. cit.*—makes light of the sulphates of zinc and copper, regarding nitrate of silver as greatly superior.

* ROBERT JACKSON—*loc. cit.*, last note—after speaking of the efficacy of injections of "white vitriol and alum, blue vitriol, corrosive sublimate, &c.," writes: "A dilute solution of the nitrate of silver might be employed for the same purpose with a reasonable prospect of advantage, but I have not the satisfaction to say that I have seen it so employed." This passage is repeated in the second edition of his work—Vol. II, p. 64. CHEYNE—*loc cit.*, last note. HUDSON—*op. cit.*, note †, p. 779, *supra*.

† BOUDIN—*op. cit.*, note ‡, p. 778, *supra*. TROUSSEAU—*op. cit.*, note §, p. 778, *supra*; MASSELOT et FOLLET—1843, T. II, p. 174, *op. cit.*, p. 439, *supra*; W. GARLIKE—*On nitrate of silver in certain cases of dysentery*, &c., The Med. Times, Vol. XVIII, 1848, p. 57; J. S. WEATHERBY—*A notice of dysentery as it prevailed in Gordon and Cass counties*, Southern Med. and Surg. Jour., Vol. VII, 1851, p. 727; A. B. PALMER—*Report on dysentery*, The North-Western Med. and Surg. Jour., Vol. IX, 1852-3, p. 297; BAMBERGER—*loc. cit.*, note **, last page; FOUQUET—p. 214, *op. cit.*, p. 725, *supra*; DUCLOS (of Tours)—*Rech. sur l'emploi du nitrate d'argent dans la dyssenterie aiguë*, Bull. Gén. de Thér., T. LXI, 1861, p. 97; L. GROS—*Nouvelles obs. à l'appui de l'emploi du nitrate d'argent dans le traitement de la dyssenterie*, same Vol., p. 433; SAVIGNAC—p. 436, *op. cit.*, p. 620, *supra*; T. CARADEC—*Du traitement de la dysenterie par le nitrate d'argent*, L'Union Méd., T. XXI, 1864, pp. 233 and 259; and H. GESTIN—*Note sur une épidémie de dysenterie qui a régné à Brest depuis le mois d' Octobre, 1866, jusqu'en Mars*, 1867, Archives de Méd. Navale, T. VII, 1867, p. 321.

‡ See, in Section II, the reports of PENROSE—p. 45, *supra*; ELLINWOOD—p. 52; HARRISON—p. 82; WHITE—p. 85; GRANGER—p. 86; and COOPER—p. 93: besides HARTSUFF'S cases referred to in the text, viz: cases 4 to 18, inclusive—p. 48 *et seq.*, *supra*. One of these, case 8, was an intercurrent diarrhœa of brief duration in a wounded officer who died a few weeks subsequently. Of the fourteen remaining cases, five, viz: cases 6, 7, 10, 11 and 18, were shortly after transferred to other hospitals, where it is reported that they were still suffering from diarrhœa. The success of the method was not therefore very conspicuous. SAVIGNAC—*loc. cit.*, last note—regards a one-eighth to one-quarter of one per cent. solution as sufficiently strong. Some have ventured to use a one-half per cent. solution, (1 gramme to 200 grammes of water,) but this is not usually required. On the other hand, WARING—p. 103, *op. cit.*, p. 936, *supra*—gives a formula for an enema, used by MCGREGOR in chronic dysentery, containing 20 grains of the nitrate in two fluid ounces of mucilage combined with opium. HARTSUFF—*loc. cit.*—used 10 to 15 grains to the ounce of water.

of preparation is subjoined.* Barrallier, who admits that the product is complex and of uncertain composition, claims, nevertheless, that in practice it gives satisfactory results.† This modification of the silver method has not, however, attained general popularity.

Much less favorable results than those claimed for silver injections by most of the writers cited have, however, been obtained by other physicians who have used them. Baly, although he admitted that they were useful, preferred black wash and laudanum; Austin Flint reported six cases in which silver enemata were employed, with apparent benefit in but three; Vogt declared that in his experience they often produced pain and irritation; that weak solutions were seldom beneficial except in the mildest cases, and that stronger ones proved uncertain in their effects; Niemeyer counselled against employing such injections at all; and Heubner states that he resorted to them in the Franco-German war without any very definite results.‡

I incline to the opinion that the lavish praise bestowed by some writers upon this mode of medication is hardly warranted by the clinical details that have been reported; and although it is not surprising that the introduction of such a styptic into the rectum should sometimes, temporarily at least, check the flux, it is difficult to believe that the small quantity of solution usually injected is likely to reach the ulcerated surfaces that may exist in any part of the colon. This objection was long since recognized by Hare, who proposed to escape it by injecting fifteen grains of nitrate of silver, dissolved in two and a half or three pints of water, through a flexible tube introduced beyond the sigmoid flexure; all parts of the colon would thus be thoroughly reached.§ If the contact of the silver solution is so beneficial to the diseased mucous membrane as has been claimed, this method should certainly prove efficacious, yet few physicians have ventured to adopt it. Some success has, however, been obtained in chronic fluxes kept up by ulcers near the anus from the application, through a speculum, of a concentrated solution, or solid stick, of nitrate of silver directly to the ulcerated surface. Walsh cured a case in this way in 1848, and the method has since been employed with good results by Kennedy, Taylor, Maury and Dills, while T. Gaillard Thomas has successfully used pure nitric acid in the same manner.‖

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* J. Delioux de Savignac—*Considérations chimiques, physiologiques et thérapeutiques sur les sels d'argent*, Gaz. Méd., T. VI, 1851, p. 553, and *loc. cit.*, note †, last page. His method is briefly as follows: The whites of one or two eggs are dissolved in 200 grammes of distilled water and filtered through a cloth; 50 centigrammes of nitrate of silver are then dissolved in a little distilled water in another vessel, and a solution of 50 centigrammes of chloride of sodium in a little distilled water is prepared in a third. The two saline solutions are then poured simultaneously into the solution of albumen, and the whole is stirred thoroughly with a glass rod. Thus prepared the solution is quite transparent and free from precipitate. It should always be used immediately after it is made, but the silver in this form is reduced so slowly by contact with metals that it is not necessary to employ a glass syringe. Savignac claims that this mixture is less irritating than a simple solution of the nitrate in distilled water and more efficacious. He thinks that the silver in this form is readily absorbed, which, if true, would in my opinion constitute a serious objection to its use; and in his enthusiasm goes so far as to suggest that it exercises a special dynamic influence on the disease, (whatever that may mean:) "Ils agissent plutôt dynamiquement que topiquement. L'argent aurait-il une influence spéciale sur les conditions essentielles de la dysentérie?"

† See Barrallier—p. 783, *op. cit.*, p. 603, *supra*.

‡ Baly—p. 537, *op. cit.*, p. 535, *supra;* Austin Flint—p. 212, *op. cit.*, note §, p. 710, *supra;* Vogt—S. 193, *op. cit.*, p. 645, *supra;* Niemeyer—Bd. II. S. 756, *op. cit.*, p. 645, *supra;* Heubner—S. 547, *op. cit.*, p. 529, *supra*.

§ E. Hare—*On the treatment of tropical dysentery by means of enemata of tepid water*, The Edinb. Med. and Surg. Jour., Vol. LXXII, 1849, p. 40. The method referred to in the text was employed in the treatment of chronic cases, and was preceded by the large injections of warm water which will be described further on. Among the physicians who have used injections of nitrate of silver in this way I may mention particularly my friend H. C. Wood—*On the rational treatment of dysentery*, Philadelphia Med. Times, Vol. VIII, 1877–8, p. 25—who remarks: "My experience in angina led me at once to fasten upon nitrate of silver in these experimental trials," and who ventured upon stronger solutions than were injected by Hare, whose method he follows, but to whom he does not allude. As to the quantity of the nitrate that may be used, he remarks: "Drachm doses of the nitrate have in no case produced any constitutional symptoms, and doses of less than forty grains have not accomplished much good. Twenty-five grains to the ounce is a very common strength for use in angina, and when a drachm of the nitrate is dissolved in three pints of water for an injection, the strength of the solution is only a little over a grain to the ounce." He reports one case of acute and six of chronic dysentery successfully treated with these injections.

‖ That Albert Walsh treated a case in this way in May, 1848, is stated by H. Kennedy—*On one of the forms of diarrhœa*, &c., The Dublin Med. Press, Vol. XXVI, 1851, p. 387—who reports a similar case successfully treated in the same manner by himself. Other cases are reported by Robert Taylor—*Report of a case of chronic diarrhœa, with muco-sanguineous discharges, depending upon ulceration of the rectum*, Buffalo Med. and Surg. Jour., Vol. IV, 1864–5, p. 8; Richard B. Maury—*Successful treatment of chronic dysentery by topical medication*, Atlanta Med. and Surg. Jour., Vol. X, 1872–3, p. 516; and M. Dills—*The topical treatment of chronic dysentery*, New York Med. Jour., Vol. XXIII, 1876, p. 396. See also T. Gaillard Thomas—*Remarks on chronic dysentery, with the history of a case of five years standing, cured within five weeks by topical treatment*, same Vol., p. 1.

Of the *drying remedies* the *subnitrate of bismuth* is the only one which has attracted much attention as a clyster in modern times. Such enemata, recommended by Monneret,* have been used to a limited extent; but it is so easy to bring this insoluble powder into contact with all parts of the alimentary canal by administering it by the mouth in adequate doses that it can rarely be necessary to employ it by the rectum.

*Iodine clysters.*—Injections of iodine were first employed in dysentery by Eimer, who reported the success of his trial in 1851, and have been adopted to a limited extent in Germany, where they have been praised especially by Mauthner.† In France they have enjoyed a greater reputation. Here they were independently experimented with by Savignac, whose first account of his trials was presented to the Academy of Medicine in the summer of 1852, and who has zealously claimed as against Eimer the doubtful honor of having been the first to use the method; Chapuis, Aran and Bossu claim to have employed it with success.‡ The method of Eimer was to inject twice a day or oftener five to ten grains of iodine dissolved with as much iodide of potassium in two or three ounces of water; Savignac used tincture of iodine with iodide of potassium in the same way. Eimer employed these injections in acute dysentery, and thought they exerted a local antiphlogistic action; Savignac limited their use in acute dysentery to obstinate cases, employed them especially in chronic fluxes, and supposed them to act constitutionally as well as locally.

Vogt, who gave this method a fair trial during 1853 and 1855, has exposed without pity the objections to it. He found that weak solutions were well borne, but of little benefit, while stronger ones often gave rise to severe pain without checking the dysentery, or actually served to make it worse. The action of the remedy, both as to the production of pain and its effect upon the flux, was very uncertain; some patients, indeed, recovered, but in others the treatment gave rise to so much local trouble that it had to be abandoned; in no case could he detect any beneficial effect which could be attributed to the absorption of the iodine.§ Little has been heard of this method of medication of late,‖ and the hope may be expressed that it will become obsolete.

*Ipecacuanha clysters.*—Injections of infusion or decoction of ipecacuanha were already employed in the treatment of dysentery by Helvetius in the latter part of the seventeenth

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* MONNERET—T. LXXI, 1866, p. 484, *op. cit.*, note *, p. 789, *supra*. I may add that HARE—p. 40, *op. cit.*, note §, last page—sometimes used with his long tube a mixture of catechu and chalk, and with alleged benefit.

† EIMER—*Zur Therapie der Ruhr*, Zeitschr. für rat. Med., Bd. X, 1851, S. 238. From a remark on S. 241 it appears that he used the method in the autumns of 1849 and 1850. MAUTHNER—*Klinische Mittheilungen*, Jour. für Kinderkrankheiten, Bd. XXII, 1854, S. 246—found these injections useful in the dysentery of children.

‡ According to his own account, SAVIGNAC made his first trials of this method in the latter part of the year 1851, that is, after EIMER's paper was published. He presented his memoir on the subject, upon which he relies for priority, to the Academy of Medicine July 20, 1852—Bull. de L'Acad. Nat. de Méd., T. XVII, 1851–2, p. 879. This memoir was not published till the next year; it was entitled *Essai sur l'emploi des injections iodées dans le traitement de la dyssenterie chronique*, Gaz. Méd., T. VIII, 1853, pp. 197, 211 and 734. It was also published separately by J. B. BAILLIÈRE, Paris, 1853. For his first reclamations against EIMER, see his paper entitled *De l'emploi des injections iodées dans le traitement de la dyssenterie*, Bull. Gén. de Thér., T. XLIV, 1853, p. 28; they are repeated in his treatise on dysentery—p. 441, *op. cit.*, p. 620, *supra*. To establish his unjust claim SAVIGNAC is driven to pretend that EIMER's first publication is no earlier than the abstract of it inserted in the Bull. Gén. de Thér., November 30, 1852. The original paper, published in 1851, he entirely ignores. It has been quite *la mode* for French *savants* to deal in this manner of late with German rivals, but a more scandalous illustration of this particular phase of national vanity I do not remember to have encountered. The method finally adopted by SAVIGNAC was to dissolve 10 to 20 grammes of tincture of iodine in 200 to 250 grammes of water by the aid of half a gramme to a gramme of iodide of potassium—p. 442, *op. cit.* He regards it as applicable to acute dysentery when the disease resists other means, but especially to dysenteric diarrhœa and chronic dysentery—p. 445. After the administration of such injections iodine can be detected in the urine and saliva, and the patient recognizes its taste. It probably, therefore, acts constitutionally as well as locally—p. 448. The observations of CHAPUIS, who used the method with alleged success in the dysentery of Martinique, are contained in a letter which SAVIGNAC has published in his essay cited above—Gaz. Méd., T. VIII, p. 734. F. A. ARAN—*Note sur l'épidémie actuelle de choléra-morbus et sur son traitement*, L'Union Méd., T. VII, 1853, p. 610—employed it with success in the diarrhœas of epidemic cholera. The observations of BOSSU are reported by A. L. H. MONTOZON—*De l'heureux emploi de la teinture d'iode dans le traitement de la dysenterie chronique*, Paris Thesis, No. 11, 1856.

§ VOGT—S. 191, *op. cit.*, p. 615, *supra*.

‖ I may note here the suggestion of H. M. LYMAN—*loc. cit.*, p. 709, *supra*—that the compound tincture of iodine dissolved in glycerine with a little extract of belladonna may successfully be "carried to the seat of the disease," by means of a long flexible injection-pipe, when the flux is kept up by ulcers of the sigmoid flexure. He claims to have derived great benefit from this method, but in the only case particularized as having been "cured" in this way, the disease returned a few months after.

century,* and were revived by Abercrombie in the early part of this.† Since the modern revival of the internal administration of ipecacuanha in dysentery they have come into more general use. Massey used ipecacuanha in enemata with laudanum in 1859, but was not satisfied that he saw any marked benefit from this mode of treatment;‡ Whittingham, Warburton Begbie and Dyce Duckworth report a greater degree of success.§ Injections containing powdered ipecacuanha beaten up with mucilage have been resorted to with alleged advantage by Jessop, Barter, Ferrell and Birch.‖ In France injections of a decoction of ipecacuanha have been lauded by De Mussy in dysentery and chronic diarrhœa, by Chouppe in cholera infantum and various forms of diarrhœa.¶ Any discussion as to whether the decoction or the powder suspended in mucilage is the better form for ipecacuanha clysters, may well be postponed until more conclusive evidence is brought forward than is afforded by the papers just cited that either produces effects, in this way, which cannot be obtained equally well by the internal use of the drug. Meanwhile the fashion which is bringing ipecacuanha clysters into vogue has at least the merit of affording a less objectionable substitute for the too frequent use of clysters of iodine and nitrate of silver.

*Antiseptic clysters.*—The putrid character of the discharges from the bowels in many forms of flux, and the belief that the absorption of putrid matters from the alvine contents frequently aggravates the constitutional condition of the patient, has not unnaturally suggested the attempt to modify or arrest the putrefactive changes, going on in the contents of the colon, by means of antiseptic clysters. Pringle relates that Hunter, one of the surgeons in the expedition to Portugal, frequently used a strong decoction of Peruvian bark with this view.** The same speculation appears to have led to the use of clysters of chamomile flowers and other bitters which were employed by Zimmermann and others.†† The infusion of Peruvian bark was used for the same purpose by Ballingall and Annesley; the latter sometimes substituting infusion of calumba.‡‡ These and other tonic infusions or decoctions have been occasionally employed by subsequent physicians, sometimes with a view to their antiseptic action, but perhaps more frequently with the expectation of producing a tonic effect, or even with no other intent than to secure the slight astringent action belonging to most articles of this class.§§ Clysters containing *charcoal*, to which attention was directed by Robert Jackson, have since been employed for their antiseptic effect by Bankier, Savig-

* See note ‡, p. 692, *supra*. † ABERCROMBIE—p. 280, *op. cit.*, p. 553, *supra*. ‡ MASSEY—*op. cit.*, note †, p. 696, *supra*.

§ RICHARD WHITTINGHAM—note †, p. 697, *supra*. J. WARBURTON BEGBIE, in the course of the discussion of MCKIDD's paper—cited note ‖, p. 696, *supra*—mentioned that he had frequently used injections of ipecacuanha in chronic diarrhœa, and often with good effect. DYCE DUCKWORTH—Vol. VII, p. 117, *op. cit.*, note †, p. 699, *supra*—mentions also that such injections had been commonly employed in India.

‖ C. M. JESSOP—*Ipecacuanha in dysentery*, The Indian Med. Gaz., Vol. VI, 1871, p. 139—used 10 grains of powdered ipecacuanha with half a drachm of laudanum and two ounces of decoction of arrowroot or of mucilage: an injection was given three times daily. J. F. BARTER—*The treatment of dysentery*, same Vol., p. 181. H. V. FERRELL—*Treatment of dysentery by ipecac enemata*, The Clinic, Vol. II, 1872, p. 74—used three times a day an enema containing a drachm of powdered ipecacuanha in six ounces of mucilage of acacia: eleven cases were thus treated successfully. In eight of them no other medication was employed. E. A. BIRCH—*On some practical points in the treatment of the acute infantile bowel complaints of India*, The Indian Annals of Med. Sci., Vol. XVIII, 1876, p. 347.

¶ NOËL GUÉNEAU DE MUSSY—*Some observations on the local action of ipecacuanha*, The Practitioner, Vol. XIII, 1874, p. 185, also *Clinique Médicale*, T. II, Paris, 1875, p. 109. H. CHOUPPE—*De l'emploi de l'ipéca dans le choléra infantile, et quelques autres formes de diarrhée*, Le Progrès Médical, 1873, Nos. 20, 23 and 27, (the Vol. for this year is not in our library,) and 1874, pp. 39 and 75; also, by the same—*Note sur l'emploi d'ipécacuanha administré en lavements dans la diarrhée cholériforme des jeunes enfants, et dans la diarrhée des tuberculeux*, Bull. Gén. de Thér., T. LXXXVI, 1874, p. 481.

** PRINGLE—p. 275, *op. cit.*, p. 640, *supra*: "At this time, supposing that the rectum, from the irritation occasioned by the incessant motions, tended to a mortification, I endeavoured to quiet the spasms by repeated anodyne clysters, but without any antiseptic ingredient. Something however of that kind has been tried by others. For Mr. Hunter, one of the surgeons on the expedition to Portugal, told me, that he had frequently used antiseptic clysters with good effect, when the patient was worn down with continual motions and a tenesmus. His first trial was with four ounces of a strong decoction of the bark, in which he dissolved some grains of opium; and afterwards, he found that a decoction either of the tormentil-root, or of oak-bark, with opium, answered the same purpose."

†† ZIMMERMANN—*loc. cit.*, note ‖, p. 827, *supra*.

‡‡ BALLINGALL—p. 78, *op. cit.*, p. 682, *supra*; ANNESLEY—p. 298, Vol. II, *op. cit.*, p. 621, *supra*.

§§ See, for example, the remarks of SAVIGNAC—p. 429 *et seq.*, *op. cit.*, p. 620, *supra*—on clysters of decoction of Peruvian bark and infusion of chamomile. These clysters are also commended by BARRALLIER—p. 783, *op. cit.*, p. 603, *supra*—who, however, classes them among astringent clysters. In like manner HEUBNER—*loc. cit.*, p. 829, *supra*—classes simaruba and calumba among the astringents that may be used as clysters.

nac, Farre and others.* For the same purpose *chloride of lime* was used by Bankier and Schneider; *Labarraque's solution* by Cornuel, Savignac and Morse; the *hyposulphite of soda* by Paul; and *creasote* by Willmott, Gairdner and Schneider.†

Additional prominence has been given to remedies of this class by the speculation that the presence and multiplication of low vegetable forms in the alimentary canal cause the fluxes. They are supposed not only to produce the septic metamorphoses occurring in the intestinal contents, but to give rise to the inflammatory processes in the intestinal mucous membrane, and, by invading the lymphatics and bloodvessels, to enter the torrent of the circulation and produce the constitutional disturbances that accompany the flux. If this view were correct, what more efficient means could be found to destroy the living cause of the disease than antiseptic injections? We may fail in our attempts to introduce efficient doses of antiseptic substances into the blood, or to give enough by the mouth to produce any very great effect in the lower bowel, but how easy to fill the colon, if necessary, with substances that will destroy low vegetable forms of life. Accordingly, as Christian Langius resorted to enemata acidulated with oil of vitriol, by which he hoped to destroy the vermiculi he imagined to produce fluxes,‡ the modern believers in *contagium animatum* have employed injections of diverse substances for the purpose of killing the bacteria. *Carbolic acid* has been used for this purpose by Flügel and others; *salicylic acid* by Brünniche, Trier and Berthold.§ The new speculation, like the old one, is unproven, but it is not necessary to accept either in order to recognize the benefits likely to ensue in appropriate cases from the injection of antiseptic substances, provided those are selected which are not injurious in their action upon the inflamed mucous membrane. From this point of view salicylic acid would appear preferable to carbolic.

*Clysters of water.*—The great importance attached by the Greek physicians and their followers to the injection of emollient fluids for the purpose of washing out the acrid contents of the colon in dysentery, and the apparent benefit that often followed the use of this class of clysters, has not unnaturally suggested the idea that the same good effects might be produced by means of water alone. Some, not content with the mere cleansing action of that fluid, have endeavored to increase its effect by modifying its temperature. Accordingly the superiority of *cold water* thus used has been insisted on by Baker, Bailey, Blades,

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* ROBERT JACKSON—Vol. II, p. 47, *op. cit.*, p. 830, *supra*—relates that he first learned to use powdered charcoal in dysentery in 1814. He gave it by the mouth as well as by clyster, and writes: "In all cases of diseased secretion from the interior membranes of the intestinal canal, whether in children or in adults, the effect of the powder now mentioned, was sovereign,—not less specific in this than Peruvian bark is in the cure of regular intermittents." BANKIER—p. 169, *op. cit.*, p. 637. *supra*—writes: "In those cases in which the stools have a very offensive smell, and in particular if the disease has been of long standing, we may often change this for the time being by an enema of starch and carbonas ligni or a solution of the chloruret of lime." He rubbed up the charcoal with starch, then mixed with water and a little opium. SAVIGNAC—p. 429, *op. cit.*, p. 620, *supra*—observes: "Je signalerai l'utilité toute spéciale des lavements au charbon dans les cas de selles abondantes et très-fétides." He prescribes 20 or 30 grammes of powdered charcoal in 500 grammes of decoction of linseed, or, in the gangrenous form of dysentery, in as much decoction of Peruvian bark. See also FARRE—*Good effects of charcoal enemata on the evacuations of dysentery*, The Lancet, 1862, Vol. I, p. 515.

† For *chloride of lime clysters*, see BANKIER—*loc. cit.*, last note—and SCHNEIDER—S. 32, *op. cit.*, p. 813, *supra*. For *clysters of Labarraque's solution of hypochlorite of soda*, see CORNUEL.—p. 147, *op. cit.*, p. 615, *supra;* SAVIGNAC—p. 430, *op. cit.;* and E. M. MORSE—*A new treatment for chronic dysentery*, California Med. Gaz., Vol. I, 1868-9, p. 55. CORNUEL mixed half an ounce to an ounce of Labarraque's solution in four or five ounces of fluid, and thought it especially useful in cases with purulent stools. This opinion was shared by SAVIGNAC, who regarded these clysters as producing a beneficial modification of the intestinal mucous membrane, besides acting as an antiseptic. He held, however, that the dose should not exceed 8 grammes to each injection, on account of the local irritation it is apt to produce if too strong. MORSE boldly employs one part of Labarraque's solution to twenty of water, and thinks two or three pints usually enough to give at a time. On the use of *hyposulphite of soda* for the same purpose, see PAUL—*loc. cit.*, note *, p 773. *supra*. For commendations of *creasote clysters*, see J. B. WILLMOTT—*On the use of creosote injections in camp dysentery*, London Med. Gaz., N. S., Vol. I, 1845, p. 162; W. T. GAIRDNER—*Clinical notes*, The Edinburgh Med. Jour., Vol. V, 1859-60, p. 994; and SCHNEIDER—*loc. cit.*, *supra*.

‡ CHRISTIAN LANGIUS—*loc. cit.*, note l, p. 811, *supra*. He recommended that the quantity of oil of vitriol added to the clyster should be just sufficient to communicate the slightest acidity to the taste. I cannot avoid thinking that if modern physicians would act on this practical hint, taste their clyster fluids, and administer nothing in this way that they would think unfit to be swallowed, it would be no better for their patients.

§ FLÜGEL—*Bemerk. über die Ruhr und ihre Behandlung*, Ditterich's Blätter für Heilwiss., Jahrg. IV, 1870, S. 171. Injections of *salicylic acid* (1 part to 500) were used with alleged benefit in the Communal-hospital at Copenhagen by BRÜNNICHE in 1875 and F. TRIER in 1876; I cite from the Jahresbericht of Virchow und Hirsch, Jahrg. XI, für 1876, Bd. II. Abth. 1, S. 210. A. BERTHOLD (of Dresden)—*Therapeutische Erfolge der Salicylsäure bei verschiedenen Krankheiten*, Archiv der Heilk., Jahrg. XVII, 1876, S. 261—used successfully in dysentery 2 grammes of salicylic acid to 300 of water.

Campbell, Grant, Wenzel and others.* Both Baker and Wenzel aimed at producing a local antiphlogistic effect by this method of applying cold during the inflammatory stage of acute dysentery; and both advised that ice should be added, if necessary, to reduce the temperature sufficiently. On the other hand, *hot water* has been recommended as preferable under the same circumstances by Gordon, Reid and others. Reid recommends that it should be used every two hours at a temperature of 100° to 110° Fahr., points out that vaginal injections of this temperature produce blanching and contraction of the mucous membrane with consequent diminution of the calibre of the canal, and infers that a similar effect will be produced in the colon and rectum.†

More important was the endeavor of Hare to increase the efficiency of water clysters by throwing them in through a flexible tube passed beyond the sigmoid flexure, which permits a much larger quantity of fluid to be introduced without inconvenience, and the large intestine to be really washed out. This plan was suggested by the previous attempts of O'Beirne, who had used a flexible tube in the same way for the introduction of purgative clysters in dysentery.‡ O'Beirne's chief aim was to remove accumulations of hardened fæces, but Hare pushed the idea to its logical results. His view was that the long tube changes a huge internal abscess into an external lesion, enabling us not only to wash it out and cleanse it from its putrid contents, but to employ local applications at pleasure. He especially insisted upon the idea that the grave lesions of the colon, encountered in serious dysenteries, are chiefly due to the prolonged sojourn in that part of the bowel of the acrid materials, which are too rapidly moved along the small intestine to produce similar effects in that portion of the intestinal canal.§ This view is quite in accordance with the old Greek pathological notions; is it or is it not in accordance with the actual facts? The method of Hare was used with success by James Irving and some other physicians in Bengal,‖ yet

* W. BAKER, in a letter to JOSEPH KENT—The Philadelphia Jour. of the Med. and Physical Sciences, Vol. I, N. S., 1825, p. 411—writes: "I use very COLD WATER, (rendered so even by ice,) thrown up the bowels in form of an enema, every half hour. * * * If the gut be topically affected with heat and inflammation, what, let me ask, can be more likely to allay that inflammation, than bathing the inflamed coats of the intestine with cold water?" F. K. BAILEY—*Dysentery*, The North-Western Med. and Surg. Jour., Vol. IX, 1853, p. 386. F. BLADES—*Cold water in dysentery*, Vol. X, 1853, p. 152. CAMPBELL—Vol. XIV, 1858, p. 83, *op. cit.*, p. 402, *supra*. ALEXANDER GRANT—*Remarks on hill diarrhœa and dysentery*, Indian Annals of Med. Sci., Vol. I, 1853–4, p. 328; and B. WENZEL—*Zur Behandlung der Ruhr*, Berliner klin. Wochensch., Jahrg. X, 1873, S. 575. HEUBNER—p. 543, *op. cit.*, p. 529, *supra*—accuses these cold-water enemata of increasing the tormina. Cold water enemata have also been employed in chronic cases by M. J. B. MESSEMER—*Cold water enemata as a therapeutic agent in chronic diarrhœa*, The Amer. Jour. of the Med. Sciences, Vol. LXXVI, 1878, p. 133—who claims that they possess "astringent properties."

† GORDON—*loc. cit.*, note ‡, p. 769, *supra*. J. J. REID—*Treatment of acute dysentery by injections of hot water*, The New York Med. Jour., Vol. XXIV, 1876, p. 603.

‡ JAMES O'BEIRNE—*New views of the process of defecation*, &c., Amer Ed., Washington, 1834, p. 85—held that in dysentery "the chief curative indication should be to pass up the gum elastic tube and introduce it into the sigmoid flexure, in order to give exit to the accumulated and pent up contents of the cæcum and colon." In the appendix to this work he writes: "Dysentery having just reappeared in this city, I have had opportunities of trying my novel mode of treating the disease." He then relates two cases in which the flexible tube was used, and injections of from one to four pints of warm water with one or two ounces of castor oil and as much olive oil thrown in. The result in each case was the evacuation of considerable quantities of hardened fæces with mucus and flatus, and the relief of the symptoms.

§ E. HARE—p. 54, *op. cit.*, p. 831, *supra*: "The substance, then, of the whole argument is this. The long tube changes a huge internal abscess into an external, and enables us to wash out and cleanse from it its putrid contents. It also enables us to foment and soothe, by *local* applications, the sloughing and ulceration these contents have caused on its surface." He remarks: "And can I be wrong in concluding, that dysentery in its primary nature, as seen in the small intestines, and parts of the colon protected from the secretions, is a mild and harmless disease, and that, therefore, if we remove quickly these acrid secretions, we shall disarm dysentery of its terrors?" With these views he begs his readers not to "cease repeating the injection till you are satisfied that the colon is evacuated and cleansed"—*loc. cit.* See also a later article by the same physician—p. 485 *et seq.*, *op. cit.*, note *, p. 401, *supra*: "The moment a patient was admitted, his bowels were thoroughly washed out by a powerful syringe, with a flexible tube passed above the sigmoid. Warm water without limit in quantity was then slowly injected by a powerful pump, till the patient complained of the distension, and the abdomen was visibly enlarged." Then, after describing an apparatus suitable for these injections, he remarks that it is equally desirable to wash out the dysenteric colon when its contents are liquid as when they are solid, for the liquid contents also, "whether bilious, or secretions from the inflamed mucous membrane itself, are always in all forms of dysentery intensely acrid. The whole object then of the treatment is, to wash out these carefully, to constantly renew the ablutions and fomentations with warm water enemata, and to calm with opiates or bleeding, the constitutional excitement. * * * By passing an elastic tube beyond the sigmoid, I have found in more than three hundred cases of the severest form of dysentery, not the slightest difficulty in washing out the colon, from cæcum to anus. * * * Wash out the colon, and we place it in the same condition as the small intestine, and save it from disease. * * * In treating 346 cases in Calcutta, I had but 4¼ per cent. deaths."

‖ JAMES IRVING—*Cases of dysentery treated by enemata of warm water*, The Edinburgh Med. and Surg. Jour., Vol. LXXI, 1849, p. 101—remarks, after speaking of the observations of O'BEIRNE and HARE: "This plan is now extensively adopted in Bengal, and has been used to some extent in the artillery hospital at Subathoo." He himself contributes the details of five cases treated with success by this method; but to these enemata he often added, "with advantage, a few drops of laudanum and a few grains of acetate of lead."

did not succeed in obtaining recognition as a common mode of treating dysentery. The inconvenience of faithfully employing it was no doubt an obstacle, but various theoretical objections were urged against it which prevented any very extensive trial.

Morehead earnestly denied that dysentery is mainly kept up by the acrid nature of the secretions that enter the large intestine, thought that in this disease the coats of the intestine were often so friable that the distension produced by large injections would be dangerous, and argued that the plan of Hare claimed a therapeutic importance for the application of warm water to the intestinal mucous membrane unwarranted by anything known of its effect upon external inflammations. Vogt declared that he was unable to conceive how Hare had succeeded in introducing such large quantities of water; in his experience it often happened that small quantities, not exceeding two ounces of the blandest fluids, were immediately rejected, in spite of every possible precaution to secure their retention.* But neither of these excellent physicians professes to have tried the method of Hare even in a single case, and therefore their plausible arguments contribute nothing to the decision of the practical questions: Are such injections well borne? Do they do good?

Dulles reports that Monti has recently employed large enemata of water with advantage in various disorders of the large intestine, using a long flexible tube, and relying upon gravity, instead of the force-pump used by Hare, to secure the introduction of the fluid. He himself relates a case of infantile enteritis successfully treated in this way.† Certainly the method would seem well worthy more extended trial than it has as yet received. But in future attempts in this direction it would appear desirable not only that the fluid injected should be as nearly as possible of the temperature of the body, but that chloride of sodium or some other neutral salt should be added to it to make its specific gravity approximate that of the blood in order that the disturbing influence of rapid endosmotic processes may be avoided. The practice of the Greeks, who commonly used clysters of whey or barley water for the purpose of washing out the intestine, had at least this advantage over simple water, but with our present views the addition of some substance not itself prone to enter into fermentation at the temperature of the body would appear preferable.‡

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* MOREHEAD—p. 309, *op. cit.*, p. 657, *supra*. VOGT—S. 189, *op. cit.*, p. 645, *supra*.

† C. W. DULLES—*Irrigation of the large intestine*, Philadelphia Med. Times, Vol. VIII, 1877, p. 125. The method is ascribed to ALOIS MONTI of Vienna. Two practical points are insisted upon in the paper: First, the superiority of gravity injections over those thrown in by the intermittent action of a syringe; and second, that the rectum should be distended with fluid before attempting to pass the tube through the sigmoid flexure, thus rendering its passage safe and easy.

‡ In this place I may refer to an interesting paper by ROBERT BATTEY (of Rome, Georgia)—*Permeability of the entire alimentary canal by enema, with some of its surgical applications*, Virginia Med. Monthly, Vol. V, 1878, p. 551. In this paper, which is a synopsis of an essay presented to the American Medical Association in June, 1878, the author states that in March, 1873, while giving a large clyster of soap and water to a sick woman, she recognized the taste of soap in her mouth. In January, 1874, he established the feasibility of injecting fluids into the anus of a cadaver until they escaped by the mouth. He then cites several cases in which castor oil injected into the rectum has been vomited, and claims to have discovered "the new fact of the entire permeability of the canal by enema." He remarks: "This discovery, made by the writer as before stated, upon the 3d of March, 1873, was certainly new to him, and he believes was equally new to the profession when he brought it before the Atlanta Academy of Medicine in May, 1874, and published it to the world in the Atlanta Medical and Surgical Journal in June of that year. He, therefore, feels warranted in claiming it as his original discovery, until some other member of the profession shall manifest a disposition to contest the claim and possess himself of any credit which may be attached to it"—p. 556. See, also, by the same author, *Intestinal obstructions; a safe and ready method*, Atlanta Med. and Surg. Jour., Vol. XII, 1874-5, p. 129; the cases reported by A. B. COPELAND and T. S. MITCHELL—same Jour., Vol. XIII, 1875-6, p. 269; and the case reported by H. M. HEARN—*Castor oil vomited up forty minutes after being injected into the rectum*, Nashville Jour. of Med. and Surg., Vol. XIV, 1874, p. 220. Dr. BATTEY makes his claim to priority so modestly that I regret to deprive him of any credit that may belong to it; but unfortunately the facts do not support it. A. GUAYNERIUS, who flourished in the fifteenth century, in his *Tractatus de fluxibus*, Cap. 2—I cite the Lyons Ed. of 1534, fol. 136—relates the story of a man who vomited a suppository previously introduced into his rectum. J. MATTHIAS DE GRADIBUS, in his *Practica, De Aegritudinibus stomuci*, Cap. 5, *de vomitu*, fol. 213, Venice Ed., 1502, relates the case of a girl twelve years old, suffering from ileus, who not only vomited fæcal matters but afterwards clysters, which were rejected by the mouth shortly after they were introduced into the anus. This state of things lasted for three days, during which suppositories introduced into the rectum were vomited in the same manner; and when it was attempted to keep a suppository in place by a string, the string broke and it was speedily vomited. SENNERTUS—T. III, p. 95, *op. cit.*, p. 645, *supra*—who cites these cases, together with one observed by J. OPTHEUS, in which a piece of tallow candle, used as a suppository, was vomited shortly after its introduction, uses them to support his speculation that ileus is not due to actual obstruction but to a reversal of the peristaltic movement of the intestine. I. DE DIEMERBROECK—*Anatomes* Lib. I, Cap. 8, Opera, Utrecht, 1685, p. 26—relates a case in which a suppository, and one in which a clyster was vomited. I had made notes of these observations for another purpose before I read Dr. BATTEY'S paper. I have made no attempt to search for others, except to look into the work of MORGAGNI—*op. cit.*, p. 538, *supra*—in whose *Thirty fourth Epistle*, § 29, references will be found to a number of such cases. That prudent observer has well presented the matter,

*Other clysters.*—Among the other substances that have been employed in this way may be mentioned *corrosive sublimate*, used by Robert Jackson and Kopp; *black wash*, by Cheyne, Annesley and Baly; *infusion of tobacco*, by Abercrombie and Bampfield; *warm wine*, by Cazin; *turpentine emulsion*, already tried by Cheyne, which subsequently enjoyed considerable popularity; *chlorate of potassa*, recommended by Löbel and Mead; and *glycerine*, by Daudé.* It would be easy, but it is unnecessary, to extend this list, nor is it worth while to dwell upon the various *purgative clysters* that have been prescribed, such as *soap and water* by Jackson, or *castor oil* by O'Beirne and others;† however convenient this method of administering purgatives has been found in other diseases, it may well be doubted whether it is not better in the case of the fluxes to give them by the mouth only, and to rely for evacuating the lower bowel, if enemata are used at all, upon large injections of warm water prepared as indicated in the preceding paragraph.

EXTERNAL MEDICATION.—Fomentations, cataplasms and plasters of various kinds, applied externally to the abdomen, played a prominent part in the treatment of fluxes by the Greek physicians and their followers. Directions for a variety of such applications have been preserved by Ætius in his account of the treatment of dysentery: Wool sprinkled with oil of rue and powdered cummin; cataplasms containing astringent herbs, which were supposed to exert in this way also a restraining influence upon the flux; anodyne cataplasms containing opium, hyoscyamus and aromatics; as well as plasters composed of pitch, resin, myrrh, pepper and the like are among the remedies he enumerates.‡ In obstinate fluxes, such as the cœliac affection, Archigenes did not hesitate to apply the actual cautery to the surface of the abdomen, or, if this was refused by the patient, to produce eschars by the

when he suggests, "you would, I suppose, say that the throwing up of glysters by the mouth, was not a very rare thing, but would not say that it is frequent." Experiments on the dead body to show that fluid can be injected through the whole alimentary canal have been made by ALFRED HALL—*On the efficacy of large purgative clysters in certain forms of obstinate constipation of the bowels,—together with a series of experiments upon living and dead bodies, undertaken to determine the extent to which fluids may, per anum, be injected into the intestines*, read before the Med.-Chir. Society of Glasgow, Oct. 28, 1845, The Monthly Jour. of Med. Sci., Vol. V, 1846, p. 1. In one of these experiments "eight pints of water were thrown up without any difficulty, the fluid passing through the *whole course of the intestines*, and partially filling the stomach." Other experiments on the subject with like results have been made by G. SIMON—*Ueber die Einführung langer, elastischer Rohre und über forcirte Wasserinjectionen in den Darmcanal*, Archiv für klin. Chir., Bd. XV, 1873, S. 122 *et seq.*; and F. KÖSTER—*Ueber grössere Darminjectionen und deren Heilwirkungen, insbesondere bei Ileus*, Inaug.-Diss., Erlangen, 1874. Moreover, besides the attempts to apply the knowledge obtained by these experiments to practical uses by the authors cited, I may refer to the paper of C. ISNARD (of Marseilles)—*Des injections forcées dans l'occlusion intestinale*, Gaz. Méd., T. XXI, 1866, p. 777—who maintains that with proper precautions it is a comparatively easy thing to cause the injection fluid to pass beyond the ileo-cæcal valve in the healthy subject. I may add that Dr. ARNOTT is cited by JAMES SCOTT—*Commentaries on the use and necessity of laxements*, &c., London, 1829—as having written: "From an erroneous opinion, that what has been called the valve of the cæcum acts as a perfect valve, allowing passage *downwards* only, few practitioners have ventured to order much liquid to be injected, for fear of over-stretching or bursting the lower part of the intestine; and the possibility of relieving disease *above* the supposed valve has scarcely been contemplated. It is now ascertained, however, that fluid may be safely injected, even until it reach the stomach"—Note, pp. 82-3. I shall not attempt in this place to discuss the practical uses of injections thrown beyond the ileo-cæcal valve, which I should certainly not employ in diarrhœa or dysentery.

* Enemata of *corrosive sublimate* are generally attributed to KOPP, (1821.) see note †, p. 724, *supra*, but they had been used by ROBERT JACKSON—p. 458, *op. cit.*, p. 770, *supra*—prior to 1817. He remarks: "Injection of soap and water—warm and in large quantity for the purpose of washing of foulnesses, followed by injections in small quantity—not exceeding two or three ounces of solution of white vitriol and alum, blue vitriol, corrosive sublimate, &c., afford relief in many cases, and even contribute materially in some to effect a permanent cure." *Black wash* (formed by the addition of calomel to lime water) was used by CHEYNE—*loc. cit.*, note ††, p. 829, *supra*—but without decisive results; on the other hand, ANNESLEY—Vol. II, p. 299, *op. cit.*, p. 621, *supra*—thought it useful when the bowels were ulcerated: and BALY—p. 537, *op. cit.*, p. 535, *supra*—regarded it as preferable to the nitrate of silver. An *infusion of tobacco* is praised by ABERCROMBIE—p. 280, *op. cit.*, p. 553, *supra*—and BAMPFIELD—p. 127, *op. cit.*, p. 682, *supra*; the latter did not hesitate to inject an infusion made with a drachm of tobacco leaves. I may add that I. DE DIEMERBROECK—*Obs. et cur. med.*, *Obs.* 18, in Opera Omnia, Utrecht, 1685—has recorded the story of a young man who swallowed without the counsel of a physician, while laboring under dysentery, an infusion made with half an ounce of tobacco in beer. Violent vomiting and purging followed, with danger to life, but the patient survived and the dysentery was cured. DIEMERBROECK adds that he has heard of two other rustics who cured themselves of dysentery in the same way, but he regards the method as dangerous. This observation appears to have suggested the subsequent use of tobacco clysters. CAZIN—see an article entitled *De l'emploi des lavements de vin chaud dans la diarrhée chronique*, Boll. Gén. de Thér., T. XL, 1851, p. 136—recommended clysters of *warm red wine*, containing one or two yolks of eggs, as both nourishing and astringent. *Emulsion of oil of turpentine* was used as a clyster in dysentery by CHEYNE—*loc. cit.*—but without marked benefit. For *chlorate of potash* clysters, see LÖBEL—*Dysenterie*, Bericht der k. k. Krankenanstalt Rudolph-Stiftung in Wien vom Jahre 1867, S. 131—and THEODORE MEAD—*Of the use of chlorate of potash and glycerine injections for the ulcerations in chronic dysentery*, New York Med. Jour., Vol. XVIII, 1873, p. 265. For *glycerine* clysters, see DAUDÉ—*loc. cit.*, note ‖, p. 824, *supra*—who commends in epidemic dysentery the use twice daily of 30 grammes of glycerine with 150 grammes of decoction of flaxseed or bran.

† JACKSON—see note *, *supra*; O'BEIRNE—see p. 835, *supra*.

‡ ÆTIUS—Tetrab. III, Serm. 1, Cap. 45, p. 603, and Cap. 50, pp. 617-8, Ed. cited p. 656, *supra*. In the latter chapter the plasters are described under the head of *dropaces*.

operation of caustic drugs.* Many of the external applications employed by the Greeks were adopted by the Arabian physicians, who also added others of similar character. They employed baths, frictions, inunctions, cataplasms and plasters of diverse kinds for this purpose,† and regarded counter-irritation by dry cups on the abdomen as a potent means of checking fluxes, as has already been mentioned.‡

It would occupy too much space to trace in detail the subsequent history of remedies of this class. The importance with which they were regarded by the physicians of the seventeenth century will, however, be apparent to any one who will take the trouble to look over the long list of liniments and ointments, cataplasms and plasters, spice-bags and fomentations, hip-baths and anal fumigations enumerated in the work of Sennertus.§ Nor would it be difficult to find many, among modern practitioners, who regard their favorite external applications with as much confidence as Sir Gilbert Blane reposed in measures of this class.‖ I suppose at the present time the majority of physicians will agree that the application of astringent fomentations and poultices to the external surface of the abdomen is quite futile; and also, notwithstanding the favor with which belladonna plasters were regarded in certain quarters twenty years ago,¶ that the good effects of anodynes, when these are indicated, can be more satisfactorily obtained by their administration internally, or by means of the hypodermic syringe; but the local application of heat by fomentations and poultices, and various modes of producing local counter-irritation are still regarded with so much favor as to require brief mention.

*Warm applications*, whether in the form of fomentations or poultices, are undoubtedly agreeable to many patients when the gripings are frequent and painful. They certainly often produce a sense of relief, and having once been tried are asked for again and again. It can hardly be imagined, however, that they exercise any very decided influence on the progress of even trifling fluxes. Savignac justly points out that when the evacuations are frequent these applications are apt to be displaced and chilled, if the patient is permitted to rise to use the close-stool,** and that they may thus do more harm than good. This inconvenience can, however, be avoided by the judicious use of a towel or broad bandage to retain the dressing in position; and, moreover, in serious cases, as already pointed out, the patient ought not to be permitted to rise.†† Hélye has insisted that the application of dry warmth to the abdomen by means of numerous thicknesses of woollen cloth is the most important part of the treatment of dysentery.‡‡ Certainly this is a greatly exaggerated view. Indeed, on trial the application of moist heat will generally be found more comforting to the patient; yet the method of Hélye, which is usually acceptable, is sometimes preferred, and is far less troublesome than the systematic use of moist heat. The

* In ÆTIUS—Tetrab. III, Serm. 1, Cap. 37, p. 591: "Quod si tamen prædicta remedia circa affectionis solutionem nihil efficiant, ustio adsumatur. Perurere autem superiorem ventrem oportet, intervallis duorum digitorum mensu aut amplioribus etiam factis, ulcerationesque servare ad multum tempus ad fluxionum in ventre transitum ne derivationem. Licet autem et per pharmacum crustas infligere, si quis ignis admotionem formidet." According to ZIMMERMANN—S. 462, *op. cit.*, p. 648, *supra*—RESTAURAND in the seventeenth century published several observations of cases of obstinate diarrhœa and dysentery which he had cured with red-hot irons. And I note that BENEDICT SYLVATICUS—*Consil. et Respons. Med.*, Geneva, 1662, Cent. II, Cons. 92, p. 190—advises the application of an issue to the left arm as a derivative in dysentery.

† See, for example, AVICENNA—Lib. III, Fen 16, Tract. 1, p. 816, Ed. cited p. 632, *supra*. ‡ See p. 684, *supra*.

§ SENNERTUS—T. III, p. 180 *et seq.*, *op. cit.*, p. 645, *supra*. ‖ BLANE—p. 461, *op. cit.*, p. 637, *supra*.

¶ See note ‡, p. 753, *supra*. ** SAVIGNAC—p. 334, *op. cit.*, p. 620, *supra*. †† See p. 656, *supra*.

‡‡ The letter of HÉLYE (de Romans) containing his views will be found in an article entitled *Maladies régnantes.—Traitement de la dyssenterie*, Gaz. des Hôpitaux, 1859, p. 481. He maintained that the cause of dysentery is cold either acting generally, as when cold weather comes on after hot, or locally, as when one sleeps on the ground. Hence the rational treatment is to apply heat: "Si le *froid* engendre la dyssenterie, la *chaleur* la guérit. Souvent, dans les hôpitaux, j'ai pu constater la différence des résultats obtenus suivant que l'abdomen était ou non très-couvert. Couvrez le ventre, couvrez-le beaucoup, couvrez-le trop, couvrez le encore, voilà le traitement de la dyssenterie. Si cinq ou six épaisseurs de bonnes couvertures de laine ne suffisent point pour arrêter les coliques et le flux intestinal, mettez-en dix, quinze. * * * Il est bien entendu que l'abdomen seul doit être ainsi couvert, le reste du corps l'étant comme à l'ordinaire. L'ipéca, les purgatifs salins à faible dose, dont les praticiens retirent dans certains cas de grands avantages, ne doivent être considérés que comme des adjuvants."

application of *flannel bandages* to the abdomen had long before been brought into prominence by Whyte and McGregor, especially in connection with the treatment of chronic dysentery,* and has since enjoyed some reputation as a means of prophylaxis.

Warm applications to other parts of the body, such as heated bricks and bottles of hot water to the feet, and the hot bath, have already been sufficiently referred to in connection with the means of producing diaphoresis.† Warm *sitzbaths* may also be briefly alluded to in this place. The early attempts to medicate them with astringent herbs, which are recorded in the works of Savonarola and other authors cited by Sennertus, are now quite obsolete;‡ but the addition of anodynes has continued to find favor, and was adopted as useful by Savignac.§ This method of attempting to produce a local anodyne effect is at best uncertain, and, since we have become acquainted with the hypodermic method, must be regarded as quite unnecessary; but sitzbaths of warm water—as hot as the patient can bear—will sometimes prove useful in relieving tenesmus, though their efficiency for this purpose has undoubtedly been exaggerated.

*Cold applications* have also been made to the abdomen even in acute dysentery. The approval of Heubner gives an air of respectability to the Neptune's girdle of the hydropathists. Yet that physician himself testifies that the application of cold to the abdomen is not well borne by the majority of patients because it so often increases the tormina, and this fact would seem sufficient to discountenance the method.‖

*Rubefacients.*—Among the vast variety of cutaneous irritants which have been used for this purpose in ancient and modern times, sinapisms, camphorated liniments and turpentine stupes may be particularly mentioned. *Sinapisms*, long familiar as a domestic remedy, are particularly suited to slight diarrhœas accompanied by griping, for which they have been extensively used: they may, however, be found occasionally useful in more serious cases, and have lately acquired a fictitious importance in connection with the non-emetic use of ipecacuanha. *Camphorated liniments*, strongly commended by Lind and Blane, have been less extensively prescribed, but are still sometimes resorted to. They may be employed merely to bathe the abdomen, or a cloth saturated with the fluid may be applied as a fomentation. *Turpentine stupes*, regarded with much favor by Copland, have also had their advocates. A flannel wrung out of warm water may be sprinkled with the oil of turpentine and applied to the abdomen as long as the patient can bear it. I myself have often seen relief afforded to the cramps that accompany acute intestinal catarrhs by the application of a cloth moistened with *chloroform liniment*.¶ In the present state of our knowledge all such applications are to be regarded as mere palliatives, by which the griping pains that so often accompany the fluxes may sometimes be temporarily relieved. Their continued use in any case should depend upon the sensations of the patient.

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* McGREGOR—p. 189, note, *op. cit.*, p. 713, *supra*: "In Egypt we gave trial to a mode of treatment which was strongly recommended to me by Dr. Whyte. It was the application of flannel bandages over the whole abdomen. In chronic cases, and in convalescents, it appeared to be of the greatest service; and, in recent cases, when the appropriate remedies were used at the same time, it appeared to shorten the cure."

† See pp. 729 and 732, *supra*.

‡ SAVONAROLA—fol. 179, *op. cit.*, p. 736, *supra*—says that some physicians use decoctions of plantain leaves, chamomile flowers, dill, oak leaves, and other astringents for this purpose. See, for other authorities, the remarks of SENNERTUS on sitzbaths—*loc. cit.*, note §, last page.

§ SAVIGNAC—p. 334, *op. cit.*, p. 620, *supra*—recommends sitzbaths, as hot as the patient can support, to be used twice a day during the acute stage of dysentery, while the tenesmus and tormina are troublesome. If simple water does not prove sufficiently calming, he adds a decoction of nightshade (morelle) or belladonna.

‖ HEUBNER—S. 543 u. 548, *op. cit.*, p. 529, *supra*.

¶ LIND—p. 263, *op. cit.*, p. 637, *supra*—used camphor dissolved in olive oil and mixed with laudanum. BLANE—p. 461, *op. cit.*, p. 637, *supra*—commends stupes "upon which thebaic tincture and camphorated spirits were sprinkled." COPLAND—Vol. I, pp. 720 and 727, *op. cit.*, p. 682, *supra*. *Chloroform liniment* is mentioned with approval by STILLÉ—p. 367, *op. cit.*, p. 650, *supra*. I myself have used the linimentum chloroformi, U. S. P., but prefer a mixture of one part of chloroform to three or four of soap liniment as more cleanly and equally efficacious. Of all such external applications, however, we may say with DEGNER—Cap. III, § 75, p. 187, *op. cit.*, p. 625, *supra*: "Effecerunt quod valebant, non vero quod debebant."

*Blisters.*—More important functions have been attributed to the use of blisters, by which it has been fondly hoped to modify favorably the progress of the intestinal inflammation both in acute dysentery and in the chronic fluxes. *Cantharides* were well known to the Greek physicians, who occasionally resorted to their vesicating powers in the treatment of disease;* the same is true of the Arabians,† but I find no positive evidence that either the Greeks or Arabians ever employed this means of producing revulsion for the relief of the alvine fluxes, and the systematic treatises on these disorders are silent as to this matter until after the beginning of the eighteenth century. Tissot, however, informs us that, when he wrote, blisters were commonly employed with great success in the treatment of dysentery; that in proportion as they acted the evacuations and pains diminished, and that he did not hesitate to employ them himself.‡

Degner vainly insisted that bloody urine was apt to follow their use:§ the new practice daily grew in popularity. Pringle applied blisters to the abdomen of his dysentery patients whenever the pains were too fixed to yield to fomentations and found that they afforded relief;‖ Donald Monro followed the same practice;¶ Zimmermann declared that blisters not only act as palliatives in dysentery, but likewise contribute to the cure, and that they are useful in all obstinate alvine fluxes.** A great number of physicians have imitated these illustrious examples. Let it suffice to name Richter, Dewar, Harty, Bampfield, Annesley, Naumann, Hauff, Cambay, G. B. Wood and Stillé.†† Tissot had applied his blisters to the calves of the legs and the nape of the neck; Zimmermann to both places at once. The sacral region was the point of election with some physicians;‡‡ but the majority

* *Cantharides* are referred to in a number of passages in the Hippocratic writings; and the circumstance that they may produce strangury, both when taken internally and when applied topically, was already then well known. I may cite in illustration the treatise *De natura muliebri*, [Ed. Littré, VII, 325,] where an infusion, containing, among other ingredients, "four cantharides without their legs, wings and heads," is advised for women with lateral uterine flexion, if their menses are suppressed, and sitzbaths directed in case strangury supervenes; also *De morb. mulierum*, Lib. I, [Ed. Littré, VIII, 179,] where five cantharides, without their wings, legs or heads, enter into the composition of a pessary intended to hasten the expulsion of a dead embryo, and a warm sitzbath is directed if strangury follows its use. See also the account of the virtues of cantharides by GALEN—*De simp. med. temp. ac fac.*, Lib. XI, Cap. 1, [Ed. Kühn, XII, 363,]—who speaks of their use in cerates for the purpose of favoring the separation of diseased nails. Elsewhere he refers to their diuretic action and their power of irritating, or, as he puts it, ulcerating the bladder—*Ad Pisonem de theriaca Liber*, Cap. X, [Ed. Kühn, XIV, 248.] DIOSCORIDES—Lib. VI, Cap. 1, fol. 322, Ed. cited p. 623, *supra*—describing the poisonous effects resulting from their internal use, mentions difficulty of urination, bloody urine and symptoms resembling dysentery. ARETÆUS—*De cur. morb. diut.*, Lib. I, Cap. IV, p. 121, Ed. cited p. 684, *supra*—mentions cantharides as one of the most powerful of the local counter-irritants that may be applied to the head in epilepsy, but advises that for three days previously the patient should drink milk as a protection to the bladder, which cantharides are apt to injure. See, also, PAULUS ÆGINETA—Lib. VII, Cap. 3, Vol. III, p. 153. *op. cit.*, p. 624, *supra*, and the commentary of Dr. ADAMS on this passage, where it is shown that the species usually employed by the ancients was the *mylabris cichorii* or *m. füsselini*.

† Thus SERAPION—Cap. 431, fol. 193, *op. cit.*, p. 806, *supra*—declares that cantharides frequently enter into the composition of ointments; and speaks of their use in removing diseased nails and clavi, as well as in diseases of the skin: they are also applied locally to cancerous ulcers; they possess putrefactive, calefacient and ulcerative properties.

‡ For an account of the introduction of blisters into modern practice, see the learned essay of FRID. HOFFMANN—*De vesicantium et fonticulorum circumspecto in medicina usu*, Opera, T. VI, p. 67, Ed. cited p. 681, *supra*—in which, however, I find no mention of their use in the alvine fluxes. TISSOT—T. II, p. 26, *op. cit.*, p. 625, *supra*—writes: "L'on emploie aujourd'hui, avec un grand succès, les emplâtres de vésicatoires, et il est certain que dans plusieurs cas, à mesure qu'ils agissent, les évacuations diminuent, les angoisses se dissipent et les forces augmentent; aussi je ne balance jamais à les faire appliquer." I may add that, according to ZIMMERMANN—see note *, p. 838, *supra*—RESTAURAND had used blisters in obstinate diarrhœas and dysenteries in the previous century; but our library does not afford me the means of verifying this statement.

§ DEGNER does not deign to mention blisters in his work on dysentery, but in his *Relatio historica de casu singulari, quo per mercurium sublimatum, in emplastro adplicatum, mors inducta fuit*, appended to his work—p. 345, *op. cit.*, p. 625, *supra*, also p. 216 of the first edition—speaking of the absorption of the ingredients of plasters by the skin, he writes: "Testante hoc solo emplastro vesicatorio, quod, si nimia quantitate, aut nimis sæpe adplicatum fuit, mictum cruentum insecutum fuisse, observationes docent."

‖ PRINGLE—p. 284, 1st Ed. cited p. 693, *supra*—sometimes "used only a warm plaister, with a fifth part of the emplastrum epispasticum added to it." I find this remark on use of blisters repeated in his 3d Ed., p. 243, and his 4th Ed., p. 282, in both of which the blistering plaster appears in the clause just cited as "a fourth part," but the passage is wanting in the 7th Ed.

¶ DONALD MONRO—p. 78, *op. cit.*, p. 625, *supra*.

** ZIMMERMANN—Cap. X, S. 421, *op. cit.*, p. 648, *supra*: "Blasenpflaster sind aber nicht nur ein linderndes, sondern auch ein heilendes Mittel in der Ruhr, in welcher sie bey ausserordentlichen Fällen, gleichwie in den übermässigen Durchbrüchen der Faulfieber, und überhaupt in allen hartnäckigen Bauchflüssen fürtreffliche Dienste thun." Further on—S. 470—he remarks that the honor of having first thoroughly investigated the use of blisters in malignant dysentery belongs to HIRZEL of Zurich and TISSOT.

†† RICHTER—Bd. I, S. 103, *op. cit.*, p. 731, *supra*; H. DEWAR—*Obs. on diarrhœa and dysentery, &c.*, London, 1805, p. 134; HARTY—p. 231, *op. cit.*, p. 732, *supra*; BAMPFIELD—pp. 133 and 210, *op. cit.*, p. 682, *supra*; ANNESLEY—Vol. II, pp. 281 and 369, *op. cit.*, p. 621, *supra*; NAUMANN—Bd. IV, Abth. 2, S. 80, *op. cit.*, p. 645, *supra*; HAUFF—S. 428, *op. cit.*, p. 534, *supra*; CAMBAY—p. 589, *op. cit.*, p. 550, *supra*; G. B. WOOD—Vol. I, p. 724, *op. cit.*, p. 671, *supra*; STILLÉ—p. 367, *op. cit.*, p. 650, *supra*.

‡‡ I make this statement with regard to the practice of TISSOT on the authority of ZIMMERMANN—S. 424, *op. cit.*, p. 648, *supra*. The application to the sacral region is spoken of by both NAUMANN and HAUFF—*loc. cit.*, last note.

have followed the example of Pringle, and applied them to the abdomen, selecting as far as possible the most tender or painful point.

During the last fifty years there has been a growing tendency among the advocates of the use of blisters to limit their application to the more advanced stages of acute dysentery and to the chronic fluxes. Simultaneously there has been a growing disposition to avoid them altogether. Bankier, who still adhered to their use in what he considered suitable cases, has recited the inconveniences of large blisters in grotesque language.* Vogt made light of the benefits to be derived from these or any other external applications. Morehead was averse to large blisters, but thought small ones, two or three inches square, occasionally useful when applied over a tender or indurated point. Savignac gave sinapisms the preference for the purpose of allaying the tormina of acute dysentery, and after persistently trying blisters in chronic dysentery, abandoned them because he never saw them do any good.† Not a few of the practitioners who have made use of them during local epidemics of dysentery have found, as Brandon did, that they exert little or no influence over the progress of the majority of the cases in which they are employed;‡ while others land them at least for the relief of pain and tympanites.§

It must be admitted that the general tenor of clinical experience is not favorable to the exaggerated hopes of benefit from the application of blisters that some have entertained. Moreover, the old speculations, by which their supposed power of curing internal phlegmasiæ was formerly explained, are now quite abandoned, and it is difficult, in the present state of our knowledge, to bring forward any plausible arguments in support of the view that the intestinal lesions can be materially modified by their influence in either acute or chronic cases. While such doubts exist the physician will hardly care to increase the risk of strangury, already existing, during the acute stage of dysentery by applying blisters at that time; and even in subacute and chronic conditions they are less and less employed by modern practitioners except as palliatives for the relief of pain, or in cases believed to be complicated with general or local peritonitis. In these latter complications their alleged usefulness is at least intelligible; and whether they modify the progress of the inflammation or not, they certainly often serve to relieve the pain. In military hospitals, however, it is best to avoid them, especially during the prevalence of gangrene among the wounded; nor should they ever be applied to scorbutic patients, or to those suffering from typhous conditions, lest the blistered surface should slough.‖

It has been recommended that, in order to escape the danger of producing strangury, the vesication should be made by strong *aqua ammonia* instead of cantharides,¶ but this

* BANKIER—p. 137, *op. cit.*, p. 637, *supra:* "Now the application of such immense blisters on the bellies of young people is a thing of no small moment, for they excite much constitutional disturbance, nay, they are not without danger in grown up persons, and had such a large one been applied over the abdomen of Job himself, it must ere it had healed have worn out his patience even if that had been as large as the fish which swallowed Jona; I have seen musquito bites for some men to contend against, but what are they to such a large blister!"

† VOGT—S. 194, *op. cit.*, p. 645, *supra:* "Es wird aber mit allen diesen so viel beliebten Dingen niemals viel ausgerichtet." MOREHEAD—p. 368, *op. cit.*, p. 657, *supra.* SAVIGNAC—p. 336, *op. cit.*, p. 620, *supra.*

‡ W. C. BRANDON—*Epidemic dysentery, as it prevailed in a portion of Floyd County, Georgia, in the Autumn of* 1851, Southern Med. and Surg. Jour., Vol. VIII, 1852, p. 139.

§ See, for example, C. C. HOWARD—*Remarks on dysentery*, same Jour., Vol. XI, 1855, p. 79. He thinks them useful also in the later stages of the disease, and is of the opinion that "very few cases of dysentery ought to be permitted to terminate fatally without their having been used." I have been unable to ascertain the extent to which blisters were employed in the fluxes during the civil war. Few of the reporters refer to their use: see, in Section II, the reports of BROWN—p. 81, *supra*—and WHITE—p. 85. On the other hand, the supplies of cantharides purchased for issue during the war were colossal, viz: 113,479 ounces of the powder and 473,789 ounces of the cerate, that is, about 3½ tons of the first and over 14½ tons of the second.

‖ As to this danger BARRALLIER—p. 775, *op. cit.*, p. 603, *supra*—remarks: "Les vésicatoires calment momentanément les douleurs, mais cette amélioration est passagère et très-souvent compensée par des accidents sérieux; sous l'influence dépressive où sont placés les dysentériques, il n'est pas rare de voir survenir des érysipèles qui s'étendent rapidement et peuvent déterminer la gangrène des parois abdominales. En résumé, nous dirons que les vésicatoires sont rarement utiles dans la dysenterie aiguë, et que leur action est douteuse et souvent fâcheuse dans la dysenterie chronique."

¶ This application has been advocated, among others, by A. FALOT, whose work I have been unable to see, and cite from BARRALLIER—*loc. cit.*

method is still more likely to cause sloughing ulcers. The same is true of pustulation with *tartar emetic*, which some have employed as a means of counter-irritation in dysentery, while pustulation with *croton oil* is perhaps less objectionable.*

Inunctions with *mercurial ointment* have already been sufficiently noticed; all the objections to producing the constitutional impression of mercury by the internal administration of the preparations of mercury during the progress of the fluxes apply also to its external use. Inunctions with *iodine ointment* and painting the abdomen with *tincture of iodine* have been resorted to to a limited extent in the chronic fluxes; it appears rational to suppose that these applications may sometimes produce good results, particularly in cases complicated with chronic peritonitis,† but further experience is required to determine the degree of benefit that can actually be obtained in this way.

* Pustulation with tartar emetic and by croton oil are among the means of counter-irritation mentioned by VOGT—*loc. cit.*, last page. CORNUEL—p. 147, *op. cit.*, p. 615, *supra*—lauded the former application especially in dysenteries complicated with ascites. Both have been praised with exaggeration by D. F. RENNIE—*Summary of views respecting a new mode of treating small pox and eruptive fevers generally, with a notice of the train of events which led to its adoption; also a few observations respecting the application of the principles involved in the cure of dysentery*, (dated Tien-Tsin the 23rd March, 1862,) in Surgeon D. F. RENNIE'S *Views on the nature and treatment of certain diseases*, Military Department Press, 1862. The application of croton oil in dysentery is mentioned with approval by COPLAND—*loc. cit.*, note ¶, p. 839, *supra*.

† The application of iodine ointment to the abdomen in chronic peritonitis has been recommended, among others, by G. B. WOOD—Vol. I, p. 859, *op. cit.*, p. 671, *supra*: see, also, Ed. of 1847, Vol. I, p. 695; and painting with tincture of iodine by BAUER—S. 395, *op. cit.*, p. 687, *supra*.

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